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TIMBER TREND SURVEY

(REVISED)

FOR

MADRAS STATE

Corrected up to 14th June 1958

By

Sri E. S. THANGAM, B.Sc. (Hons.).

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GOVERNMENT OF MADRAS
1964

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INTRODUCTION.

1. The Food and Agriculture Organisation in collobaration with ECAFE wanted to undertake a study of the Timber Trends in the Asia–Pacific region to compile country wide data on comprehensive basis regarding timber resources capacity, production and utilisation, as also the current import/export position and forests of future trends in timber. Mr. H. Tromp of the Food and Agriculture Organisation, Forestry Division, toured these countries including India in 1955 in this connection and prepared the necessary draft "outlines for country reports" and the tables connected with them. These were discussed in detail by the delegates from the States in India to the Silver Jubilee Celebrations of the Forest Research Institute, Dehra Dun in December 1956 and tentative proposals were drawn up for a programme of work.

2. Detailed instructions for the work with the tables were sent to the Chief Conservator of Forests, Madras by the Deputy Inspector-General of Forests, New Delhi in his No. F. 21–245/56/Fd., Government of India, Ministry of Agriculture, New Delhi, dated the 12th December, 1956. Certain preliminary details required viz., brief notes for sections A to E and tables 1 to 4 were compiled and sent by Sri T. B. Jambulingam, Personal Assistant (Development) to Chief Conservator of Forests, for the composite Madras State. Since the Timber Trend Survey work involved collection of field data, Sri V. S. Krishnaswamy, M.A., I.F.S., Chief Conservator of Forests, Madras, sent proposals in September, 1957 to Madras Government for permission to authorise the Forest Utilisation Officer, Madras, to take up the work with the help of selected subordinates under his (Chief Conservator of Forests) personal supervision. The Madras Government in their G.O. Ms. No. 3397, Food and Agriculture, dated 5th November 1957, accorded the necessary permission for the work.

3. In October 1957, the Forest Utilisation Officer, Madras (Sri E. S. Thangam), submitted proposals to Chief Conservator of Forests for carrying out the field work with the help of 16 selected Range Officers, serving in the various forest divisions and the details of the work to be carried out by them. The Chief Conservator of Forests, Madras approved the proposals and the work was

taken up in November 1957. The field work was completed in December 1957. At that time, the appointment of a Technical Assistant for the collection of "Rural end-use" data by proper sampling methods was considered. As the candidate selected for the job, declined to join duty, the work was not taken up. The checking, compilation and collection of the data collected for filling up tables 1 to 28 and the preparation of the draft report were completed by the end of April 1958. The final draft with the tables approved by the Chief Conservator of Forests, New Delhi, in May 1958. In June 1958, Sri N. P. Mohan, of ECAFE discussed the details of the report sent to the Deputy Inspector-General of Forests in May 1958 with the Forest Utilisation Officer, Madras.

4. Sri V. S. Krishnaswamy, M.A., I.F.S., the Chief Conservator of Forests, guided the field and office work from the beginning to the end. He was kind enough to correct the draft report. I express my gratitude to him for the help and guidance given.

5. A copy of the "Outlines for Country reports" is appended to this report for reference. Based on the instructions given therein, this report has been prepared.

E. S. THANGAM,
Forest Utilisation Officer,
Madras.

MADRAS,
14*th June* 1958.

TIMBER TREND SURVEY (REVISED) FOR MADRAS STATE.

SECTION-A.

FOREST RESOURCES.

1. *Classification of forests*—

(*a*) Reserved forests .. .. 21297·114 square kilometres. (8,226·0 square miles).

(including 3860·199 square Kilometers (1,491 square miles) of reserved lands, not yet declared as Reserved Forests under the Madras Forest Act.)

(*b*) Unreserved forests .. .. 1360·9373 square kilometers. (525·7 square miles).

(includes the lands under private people, public institutions like lepter asylum, temples, panchayat boards, municipalities and other Government departments as Public Works Department, Revenue and others).

Total .. 22658·1513 square kilometers. (8,751·7 Square miles).

The total area of the forests is 22658·1513 square kilometers (8,751·7 square miles) and this forms 17·5 per cent of the total land area in the State. As the population of the State is 33,650,917 in 1961, the forest area *per capite* comes to be 000·26 square kilometres (0·00151 square miles).

About 94·0 per cent of the forests are under the control of the Madras Forest Department. Survey and demarcation of 3861·69 square kilometers (1,491 square miles) of reserved lands mostly taken over from Zamindars has been taken up and is in progress.

TABLE No. 1.

Classification of forests.

Area in square kilometers.

Name of State.	*Reserved Forests.*	*Unreserved forests.*		*Total Forest Area.*	*Remarks.*
		Publicity owned.	*Privately owned.*		
(1)	(2)	(3)	(4)	(5)	(6)
Madras	21297·114 (8,226·0)	577·347 (223·0)	783·6903 (302·7)	22658·1513 (8,751·7)	

About 11·2 per cent of the total forest areas is inaccessible now. It is estimated that about 50 per cent of the inaccessible forest areas are under forests that could yield timber and other forest products.

Reasons why accessible forests have not been exploited.—The main reason why accessible forests have not been exploited is the high cost of extraction due to lack of suitable facilities. The other reasons are :—

(*a*) Lack of demand for the availables pecies.

(*b*) Poor durability and poor strength qualities of species available and the absence of suitable facilities for seasoning or giving them preservative treatment.

(*c*) Poor stocking due to the maltreatment of the forest in the past which call for an enforced period of rest for rehabilitation.

(*d*) Forests being protected for indirect benefits and adoption of selection system in the locality being impossible for want of suitable species, sizes and uneconomic in certain cases.

(*e*) Forests being preserved for aesthetic reasons.

(*f*) Forests being declared game sanctuaries.

3. *Main features of publicly owned forests.*—Publicly owned forests may be classified as the Reserved Forests and Reserved lands under the control of the Government of Forest Department and those under the management of public bodies like panchayat boards, temple authorities and other Government Departments as Public Works Department and Revenue.

(*a*) *Reserve Forests.*—(i) *Management.*—The objects of management tend to secure an optimum sustained annual yield generally to satisfy particular demands as local needs, industrial and other needs of the locality or by prescribing suitable measures in selected forest areas. The forest areas that cannot be worked advantagiously and need protection will be protected as such. The annual yield is fixed by volume, or area or the number of trees of exploitable girth to be felled. All the forest areas in which plantations as teak, casuarina, etc., have been raised or will be raised and those worked under selection system and as fuel coupes, have been stock-mapped. Partial enumeration has been done in areas in which selection fellings have been prescribed and those which will be converted into valuable plantations of fast growing species.

A summary of the systems of management prescribed is given below :—

I. *High Forest Systems.*—(1) Systems of concentrated regeneration—

(i) *Clear felling system.*—This is one of the commonly adopted systems for working the forests in this State and covers the tropical dry and moist deciduous forests in the plains and in the hills. The clear felling is followed by concentrated artificial regeneration of the same species as felled or some other new species. Yield is generally regulated by area and more or less equiproductive annual areas are prescribed with the help of reduced areas.

Teak, casuarina, softwoods, wattle, bluegum, cashew and fuel species are raised under this method in the State. While the whole are is clear felled in case of teak, wattle, bluegum, casuarina and softwoods, clear felling in strips only is done in case of species as cashew, fuel species and others.

(2) *Systems of diffused regeneration.*—(i) Selection system (Modified). This system is generally practised in hills forests where the terrain is steep and difficult and in remote areas which do not readily lend themselves to more concentrated working. It is applied to the tropical evergreen and the moist deciduous forests in the State. The method of working the forests appears to be the most suitable for the tropical forests, where only a few economically important species occur among numerious other less valuable species. The yield is generally regulated by prescribing the number of trees of exploitable size above a minimum girth for a particular felling cycle. To avoid over-exploitation and to ensure sustained annual yield, the safe guards generally enforced are the limiting of the removal of exploitable trees only to a definite percentage of the stocking dependent on the rate and quantity of recruitment from the lower classes to the exploitable size classes. The regeneration of economically important species in these forests is rather unsatisfactory and inadequate.

The exploitation of the valuable sandalwood forests in the state is regulated by restricting the removals only to dead trees, irrespective of their size as dead trees contain most heartwood which only is scented. There is adequate natural regeneration. In this connection, large scale mortality among sandal trees has been caused by spike disease and these constitute a major percentage of trees exploited.

II. *Coppice systems.*—(1). Simple coppice systems. The system is largely practised in the tropical dry deciduous forests mainly to meet the local demand of firewood and small sized timber. The firewood coupes in the state are worked on this system and adequate regeneration is secured through coppice regrowth. Artificial regeneration operations are done to supplement the natural coppice regrowth, whenever essential.

(2). *Bamboo fellings.*—In this State, the bamboos are worked on a 3 to 4 years cycle with a limit on the number of culm to be removed annually per culm.

Government control of fellings.—Areas which have been constituted as Reserved Forests under the Madras Forest Act are covered by Working Plans or schemes sanctioned by the Chief Conservator of Forests. Fellings are required to conform to the prescription of these working Plans and annual and periodical returns and central registers, forms and maps have been prescribed as safeguards. Deviations from the prescriptions of the Working Plan need the approval of the higher officers.

Average growing stock : All the forests in the State have not been enumerated and the extent of growing stock assessed to find out whether it is above or below the desirable level. Enumeration, partial and total, have been carried out only in cases of some of the best (timber) forests and even these indicate that our forests are relatively under stocked, more particularly in the plains. Date regarding the growing stock in the forests of this division are collected from the various working plans and details are given below :

TABLE 2.

Volume of standing wood and increment by 1955–56.

In cubic metres (1,000) of round wood.

Class af forest.	*Total Volume.*		*Gross annual increment.*		*Natural lesses by fire decay, etc.*	*Net annual increment.*
A. State Forests—						
	C. metre.	(cft.)	*C. metre.*	(cft.)		
(a) Softwoods. (Conifiers)	3,5375	(1,250)	367·9	(13)	..	..
(b) Hardwoods. (Broad-leaved)	6040,3520	(2134400)	1792144	(63680)	..	..
Total ..	60,43,8895	(21,35650)	17,92,511·9	(63693)		
B. Communal—						
(a) Softwoods. (Conifers)	..		..		..	..
(b) Hardwoods. (broad-leaved)	21,46,272	(75,840)	61,128	(2,160)	..	..
C. Private—						
(a) Softwoods. (Conifers)	..		..		..	..
(b) Hardwoods. (broad-leaved)	1637324·8	(57,856)	453,93·2	(1,604)	..	..
Grand total ..	64222491·8 (22,69,346)		1909033·1 (67,457)		321,120·1 (11,347)	158791·3 (56,110)

Notes :—(i) As most of the forests in this State are not divided into blocks and compartments and detailed enumerations are not done in the same areas at the times of revisions of working plans, no definite data are available. Based on the rotation adopted, the M.A.I. has been calculated and the figures arrived at.

(ii) Since no data regarding the natural losses is available the loss has been calculated assuming that about 0·05 per cent of the standing growth is lost by fire and other causes annually.

The gross and the next annual increments amount to 3·0 and 2·5 per cent respectively of the total standing volume. Since large areas of the forests of this State are under thorn forests type, higher increment is not obtained, with the increase of the better firewood yielding species in these thorn forests by the large scale afforestation schemes and the conversion of more areas into regular plantations, the annual increment is likely to rise in the near future.

Progress towards accumulating growing stock.—As definite working plans have been written up for the forest of this State the accumulation of the growing stock is being done in a phased manner and in a scientific way. Much depletion of the timber and firewood resources of the State forests took place during the second World War. To make good the loss, large scale intensive regeneration programmes spread over thousand of acres annually have been programmed during this decade and this work, which was begun a few years ago, is well under-way.

Other publicly owned forests.—The extent of these forests is 577·347 square kilometres. (223·0 sq. miles). There are no schemes or plans to control the fellings in these forests. Generally, the trees are removed on a selection system as and when required. These forests belong to the tropical moist and dry deciduous type. The growing stock will be generally below that of the Reserved Forests as no effective control over these forests is enforced. On an average, the growing stock will be about 60 per cent of the stand in the Reserved Forests. No regeneration operations are generally undertaken to augment the resources of these forests. None of these forests was stock-mopped except that of Elavambady Panchayat of North Arcot district with a view to take it over by the Department.

Main features of privately owned forests—General.—Most of the ex-zamin forests in this State have been taken over by the Government and are managed by the Department. Working of some of private forest extending over about 783·6903 square kilometres (302·7 square miles) are regulated under Madras Preservation of Private Forests Act.

Main size distribution.—The extent of these forests varies from a few hectacres (acres) to several (square miles) square kilometres. The forest areas are also owned by one or more persons, singly or jointly. Most of these forests are confined to the hill slopes only in the Western Ghats, the Kalroyans and the Eastern Ghats.

Management.—These forests belong to the tropical deciduous forest type. They are not managed in any scientific manner as there no working plans or schemes to work these forests. As and when the owner considers necessary, he cuts and removes the trees for timber and firewood. So, this method of exploitation ranges from selection felling to clear felling and cannot be described in definite terms. Virtually, there is no regulation of cutting aiming at sustained annual yield. None of these forests was either systematically enumerated or stock-mapped. Major portion of them are now deploted of valuable growth.

Governmental control of felling.—The fellings in the notified private forests which are more than 40·5 hectacres: (100 acres) in contiguous blocks are controlled by the provisions of the Madras Preseravtion of Private Forests Act of this State. Under this Act, permits for felling trees are issued and the fellings watched. Smaller isolated patches of forests do not come under the purview of this Act and are to some extent controlled by the General Timber Transit Rules,

applicable to all timber. The " Hill Trees Preservation Act ", also controls, to some extent, the felling of trees in the hill stations like Ootacamund, Yeroaud and Kodaikanal. As the above Acts are not adequate enough to control effectively the fellings in the private forests, it is proposed to enact fresh legislations in this State.

Comparison with the growing stock of publicly owned forests.—No enumeration data about the growing stock in these forests exists. As these forests are managed indifferently according to the wishes of the owner, the growing stock in these forests will be by for lower than that found in the public forests. On the average, it may be assumed that these forests will support about 25 to 50 per cent of the stand obtaining in the tropical deciduous type of Reserved Forests owned by Government.

Governmental policy for buyiny private forests.—There is no proposal for buying any private forests in this State.

5. *Extent of Forests subjected to shifting cultivation.*—Shifting cultivation is not allowed generally in this State forests except in the case of Kanis in Tirunelveli and Kanyakumari districts. Wherever lands are suitable for cultivation or demand for cultivation exist, cultivation is permitted by private owners.

6. *Extent of the main forest types in the use.*—The details of distribution of the various types of forests in the publicly and privately owned forests are given below:—

	Area in square kilometrrs.	(In square miles)
A. Publicly owned forests—		
Temperate forests—		
(i) Conifers	2.589	(1)
(ii) Grass lands with sholas	903·561	(349)
Tropical forests—		
(i) Evergreen	1,139·160	(440)
(ii) Deciduous	5,721·690	(2,210)
(iii) Thorn	13,530·114	(5,226)
Total ..	21,297·114	(8,226)
B. Private Forests—		
Tropical Forests—		
(i) Evergreen	82·848	(32)
(ii) Deciduous	869·904	(336)
(iii) Thorn	409·062	(158)
Total ..	13,61·814	(526)

The above classifications have been made in a broad sense and it is likely that variations may be found within each group.

7. *Growing stock of different forest type.*—Detailed analysis of the total growing stock in the various types of forests has not been done in any systematic manner in the publicly or privately owned forests. As the forests have also been only grouped in a general way, it is not possible to give accurate figures for the growing stock. The figures given can at best be only approximate. The details taken from some of the forests, representative of each type are given below :—

Forest type.	*Estimate of growing stock per acre (Hectacre).*	*Remarks.*
(1)	(2)	(3)
1 Conifers ..	70·75 cubic metres. (2,500 cft.)	The density of stocking of these forests varies from 0·1 to 1·0.
2 Grassland with sholas.	28·3 cubic metres. (1,000 cft.)	Do.
Tropical forests.		
1 Evergreen ..	113·2 cubic metres. (4,000 cft.)	The density of stocking of these forests varies from 0·1 to 1·0.
2 Deciduous ..	56·6 cubic metres. (2,000 cft.)	Do.
3 Thorn ..	1·415 to 14·15 cubic metres (50 to 500 cft.)	Do.

8. *Estimates extent of future alienation of forest land for other purposes and the total marketable growing stock involved* : —No large scale alienation of the forest lands, is anticipated in the near future except for the alienation of certain areas for river valley and hydro-electric projects, agricultural and animal husbandry scheme and other projects under the Five-Year Plans. About 28·479 Kilometres (11·0 square miles) of forest areas are expected to be alienated for this purpose. Generally, all private forests owner like to alienate the major extent of the forests for plantations and agricultural purposes.

9. *Plans for afforestation of treeless areas and the extent of bare land likely to be available in accessible locations for afforestation purposes.*—Under the Second Five-Year Plan, large scale afforestation of barren lands, village poramboke sites, river, canal and lake fringes, and road sides, have been programmed. Planting of casuarina along coastal sandy areas has been taken up.

A preliminary survey of the areas available along the banks of the major rivers of the State, viz., Cauvery, Palar, Pennar, Tamiravaruni and Vaigai and other canal systems and those near the banks of the major and minor water spreads of the State as Mettur Dam, Bhavanisagar, etc., is under progress. The final picture of the creation of these reverine and lacustrine forests will emerge only after the completion of this preliminary survey work.

Rapid reconnaissance survey of all Government lands outside reserved forests has been undertaken with a view to bringing these lands under better utility.

During the Vanamahotsva also, some planting activities are undertaken. By 1960, it is expected that 10 crores of trees will be planted in the whole of India, according to the scheme envisaged in the Land Transformation Programme of the Government of India. Based on the above targets the annual targets for the various States are fixed. The ultimate aim of the Vanamahotsavam movement appears to be planting of 2,000 crores of trees "to restore the hydrological nutritional balance of the country". (Paragraph 15 of the National Forest Policy Resolution of the Ministry of Food and Agriculture, New Delhi, No. 13–1/52–F, dated the 12th May 1952.)

10. *Details regarding non-commercial species.*—The position in this State appears to be better than those obtaining in several other States, due to lack of adequate forests. Due to lack of sufficient timber to meet thé increasing demands, whatever is marketed is sold readily.

(*a*) *Temierate Coniferous forests.*—As already stated in item 6 above, these coniferous forests were raised as plantations and so non-commercial species are almost absent in these plantations.

(*b*) *Grassland sholas.*—There is almost no demand for the variety of species that occur in these forests except for fuel, only a few are useful as medicinal plants.

(*c*) *Tropical evergreen.*—During the last World War, due to lack of timber, several new uses were found, for the species which were considered useless as timber. The matchwood and vencer industry found several new species for their use. Some of the evergreen species which come to light in this manner are: —

(1) *Lophopetalum Wightianum.*

(2) *Machilus Macarantha.*

(3) *Evodia roxburghiana.*

In spite of this, for about 60 per cent of the species market as to be discovered. Until some new utilisation method is discovered for these species, there is no scope for marketing them.

(*d*) *Tropical deciduous forest.*—The non-commercial species in this forest type forms about 30 per cent of the growing stock. This low percentage is due to lack of sufficient extent of forests in this State, as a result of which any timber extractable from the forests is sold as jungle wood. What is not saleable as timber is readily converted into firewood and sold. Thus, where facilities occur, almost the entire growing stock is saleable either as timber or firewood.

The main reasons for lack of market for the non-commercial species as timber are:—

(1) Lack of demand for the species.

(2) Poor strength properties and non-durability of species.

(3) Uneconomical cost of extraction.

(*e*) *Thorn forests.*—These forests are mainly worked for supplying firewood to the neighbouring towns and industries and so most of the growing stand is felled and converted as firewood. About 15 per cent of the stand are of useless species. Even the thorns are exploited as fencing material.

SECTION B.

LOGGING OPERATIONS.

1. *Short description of methods generally applied in logging operations.*—Under item 3, section A, the details of the various methods of working the forests in this State have been described. There is practically no area subjected to the American method of " cut out and get out " practice. In the clear felling method, regeneration is obtained either from natural coppice growth or artificially. In the remote forests, where intensive exploitation methods cannot be effectively applied, section fellings with a high girth limit are practised. For sandalwood, natural selection system is adopted and for bamboo culms more than a year old are removed, leaving a certain proportion of them behind.

In this State, as the sandalwood and bamboo extraction are carried out selectively almost over the entire deciduous forests on a prescribed felling cycle it is really difficult to assign definite areas to one particular method of logging operations. Along with these, clear felling operations are done in the same areas. Again even in areas worked as firewood coupes by the simple coppice method, a wholesale clear felling is not done as certain minor forest product yielding trees are left as standards. In view of the above difficulties in assigning areas to a definite method of logging operations, the bamboo, sandalwood and thinning operations, if done in addition to other logging operations in any area, they will be considered as overlapping logging operations and will not be taken into account for this classification. Generally expressed the proportion of the various logging operation carried out in the forests of this State are :—

(1) Selection 63 per cent.

(2) Simple coppice 25 per cent.

(3) Clear felling 12 per cent.

Logging operations are carried out generally only in the forests in the plains or those that are easily accessibly with good transport facilities. Mechanical contrivances are still unknown in the logging operations of this State and they are essentially manual. Felling of trees is done with axe, or saw. Lopping and topping are done with axe and bill hockor saw. Further conversion into logs is done with hand-saw and at times with axe also.

In relatively remote areas situated in difficult terrain, where adequate facilities for proper transport of logs do not occur, the logs are sawn immediately after clear felling and transported. Sleeper operations are carried out by this method only.

The principal modes of extraction are :—

Phase of extraction.	*Extraction.*	*Proportion.* PER CENT.
1. Stump to road	(i) Elephant.	90
	(ii) Carts.	5
	(iii) Manual.	5
2. Road to rail head	(i) Motor transport.	90
	(ii) Carts.	10
3. Permanent lines of extraction ..	(i) Railways.	20
	(ii) Motor transport by roads.	75
	(iii) Canal system.	5

with the increased availability of heavy duty diesel transport vehicles, transport by cart is getting gradually eliminated.

These lorries are able to reach the stump site itself in most cases and transport them straight to the market or depot for sale.

2. *Phase of the logging operations at which bulk of the round wood is sold*.— Large areas of forests are sold standing to contractors in public auction or by calling for tenders. The details are furnished below separately for different methods of working.—

(i) *Selection felling* :—In the case of softwood trees, the trees marked for felling are generally sold standing to contractor in public auction or by calling for tenders. The contractor fells, converts and removes the timber within a specified time limit. At some places, departmental extraction is also done. Valuable hard wood are invariably extracted departmentally. In such an event, the logs are sold at the forest or central sale depot. In the case of railway sleepers, tenders are called for, quoting rates for felling and conversion of marked trees in the forests into railway sleepers and delivery at the railway sleeper affixed rate for every passed sleeper.

In the case of sandalwood, the extraction, and transport are done departmentally. The wood is finally cleaned, classified into various sale classes and sold in public auction.

Bamboos are sold standing to contractors for felling and removal subject to certain felling rules as in the case of trees.

(ii) *Clear felling.*—In the areas that are taken up for clear felling as a preliminary operations to the raising of teak, softwood and other valuable plantations, the valuable timber species as teak, rosewood and other marketable timbers are extracted departmentally and removed to the Central Sale Depot for sale. The other growth is sold standing to contractors who are permitted to remove billets up to a minimum girth, the rest being burnt.

In the case of clear felling in patches for raising plantations like cashew, dry fuel species, etc., the entire operations are done departmentally, if there is no demand for the standing growth.

(iii) *Simple coppice.*—The fuel coupes which are worked by this method, are sold standing to contractors for felling and removal within a specified time limit, in open auction or by calling for tenders.

Sawing for conversion of round logs into sizes is generally not permitted at stump site. It is allowed for case of supply of railway sleepers.

3. *Working seasons for logging.*—The active season for logging operations in the hills is from September to June, as ordinarily it is difficult to carry out timber operations during the south-west monsoon period. In the plains, as the monsoon is not active, and the rainfall is not heavy, logging operations are carried throughout the year according to necessity, except during short periods when agricultural activities like planting, weeding and harvesting take place. Also during short spells of rain, varying from a few days to about 4 weeks. These periods of inactivity in the forests varies according to the number of agricultural crops harvested during the year.

In the case of sandalwood operations in the hills, the work is carried out practically throughout the year as the work can be staggered as not to Interfere with agricultural labour.

The transport of timber logs by motor, lorries and carts are carried out from September to June. Barring the vagaries of rainfall which do cause sudden dislocation in communications, there is no slack season for the transport of timber and firewood.

Seasonal logging does not affect the wood-based industries as sufficient stock is stored in advance.

4. *Labour employed in logging.*—Adequate labour is available for forest operations. Permanent mazdoors are not maintained by the department. The floating labour in the villages meets the demands of the forest operations. In this connection, it is seen that a small proportion of the labour force finds employment almost throughout the year to carry out some forest work or other.

The necessary labour for the operations are recruited generally from the neighbouring villages by the forest subordinates or the agents of the contractors.

The " Kangani " or " Agency " system of labour recruitment is noticed in the tracts bordering the former Travancore State, viz., portions of Kanyakumari, Tirunelveli and Madurai districts only. This system, though advantageous to the employer, is not in the interests of the labour force who actually do the work, as the " Kangani " or the " Agent " exploits them unduly as a middle men does in various ways.

In the hills (North Arcot, Madurai, Coimbatore and Nilgiris districts) the hill tribes viz., Malasans, Kurumban, Valiyans, and Malayalis form the main labour force for the various forest operations.

Good sayers generally come from the adjoining Kerala State. There is also considerable movement of labour force from this state to the adjoining States in the forest areas which lie near the border.

The details of labour employed in this State annually, permanent and temporary are furnished below :—

(i) Permanent .. 67,000 men days.

(ii) Temporary (seasonal) 12,22,000 men days.

Since the labour force employed, use only ordinary implements like axes and bill-books, no special training is considered necessary. This position will continue to remain unchanged till mechanisation makes head-way in our logging operations.

As the labour force employed is not of skilled nature, the labour recruited come mainly from the floating labour force in the villages, who are either unemployed or under-employed. The effect of the employment potential of the Forest Department even on this floating labour force is imperceptible, as it is neither able to absorb the entire labour force nor employ them throughout the year. In the circumstances, its effect on the village economy appears to be very little. On the other hand, it is the Forest Department which suffers from lack of adequate of labour during the planting and other seasons of regeneration activities, which coinside with the local agricultural operations. The above is the conditions obtaining in the few villages that lie close to the forests. In the villages that are situated far away from the forests the floating labour force are not interested in the forest work.

5. *Average volume of logs felled, lopped, and topped per men day.*—Variations from place to place exist to some extent in the out turn of work in the different phases of logging operations for the labour force employed. The outturn is depended on a variety of factors as the terrain, the type of forest, the species exploited, the sizes converted, the skill and the physical capacity of the labour employed in the various logging operations.

The details of the capacity of labour employed in the different forest operations are given below :—

(i) *Timber operations.*—The Broad leaved species ; the outturn per mazdoor varies from (10 cft. to 50 cft.). 283 Cubic metres to 1·4150 cubic metres per day with an average of 0·7075 Cubic metres (25 cft.). In conifers, the outturn works out to 2·1225 cubic metres (75 cft.) per person per day.

(ii) *Firewood Operations!*—In broad leaved species the outturn varies from 283 Cubic metres (10 cft.) in case of jungle woods to about 2·83 c.m. (100 cft.) in case of casuarina.

(iii) *Sandalwood operations.*—The felling, uprooted and rough cleaning varies from ¾ quarter to 2 quarters of rough cleaned wood per person per day.

(iv) *Bamboo operations.*—In a day, one bundle of bamboos, i.e., up to 15 numbers in case of big size bamboos or up to 100 numbers in case of small size bamboos can be collected by a person.

As already stated, the forest operations carried out are still mainly manual, with little or no-mechanisation. Only in the phase of transport and conversion of timber, mechanisation has advanced considerably. The motor lorry is definitely replacing cart, wherever possible.

In other phases as felling, logging and handling mechanisation has not even entered the fringe.

6. *Wastage in logging operations.*—(*a*) Wastage from standing tree to round wood assortment at felling site: This varies from species to species with an average of about 15 per cent loss in case of sawn logs and about 5 per cent loss in case of firewood. In case of fuel plantations like casuarina, the loss is less than 1 per cent, as even the roots are uprooted, and, the ground swept clear of the needless and twigs. The details for various species are given below:—

I. *Saw logs.*—

	Logs.
Tectona grandis	15 per cent to 25 per cent.
Pinus insignis	10 per cent.
Dalbergia latifolia	18 per cent.
Terminalia paniculata	10 per cent to 14 per cent.
Terminalia tomentosa	10 per cent.
Albizzia lebbek	10 per cent to 20 per cent.
Santalum album	10 per cent.

II. *Firewood.*—

Albizzia amara	20 per cent to 30 per cent.
Eucalyptus Globulus	8 per cent.
Casuarina equisetifolia	less than 1 per cent.

It is likely that with improved logging methods and intensive utilisation of the forest produce, the wastage could be further reduced.

(*b*) losses from log to timber sawn by hand at the felling site: Sawing at the felling site is not generally permitted except in the case of sleeper production. The wastage in case of some important species is given below:—

Species.	*Losses.*	*Remarks.*
Tectona grandis	15 per cent to 25 per cent.	....
Dalbergia latifolia	25 per cent.	....
Terminalia paniculata	25 do.	....
Terminalia tomentosa	25 do.	....
Albizzia lebbeck	15 per cent to 20 per cent.	....
Santalum album	40 do. includes sapwood which remove.	....
Eucalyptus globulus	20 per cent.	....
Albizzia amara	20 do.	....
Mesua ferrea	40 do.	Sleeperwood.
Callophyllum tomentosum	35 do.	Do.

No mechanical sawing at site has yet been resorted to, on any large scale. It still remains an unexplored field of activity.

(*c*) Losses from felling site to log at factory; losses during this phase of extraction are little or almost nothing.

7. *Production costs.*—The cost of production of timber varies from species to species and from place to place.—

(*a*) *Stumpage price.*—The st umpage price for the various methods of exploitation are furnished below:—

I. *Timber operations.*—

	RS.
Tectona grandis	1·00 to 10·00
Terminalia paniculata	1·50
Terminalia tomentosa	1·50
Legerstroemia lanceolata	1·50
Dalbergia latifolia	1·00 to 25·00
Santalum album	5·00 to 30·00

The average cost varies from Re. 1·00 to Rs. 30·00 for the various operations.

(*b*) *Felling operations.*—The details of costs for the felling operations for the various methods of working are furnished below :—

Timber operations.	*Rate in Rupees.*	*Remarks.*
(i) Tectona grandis (round)	0·06 to 0·19 per 0283 C.M. (cft.)	Rate depend on girth of tree felled.
Tectona grandis (square) ..	0·11 to 0·25 per C.M.	Do.
Dalbergia latifolia	0·17 per 0·0283 (cft.)	C. M. Bark removed and a ring of sapwood take up to heartwood in the centre of the leg.
Kagerstrienua kabceikata ..	0·5 per 0283 C.M. (cft.)	Bark not removed.
Termidalia tomentosa	0·06 Do.	Do.
Terminalia paniculata	0·06 Do.	Do.
Pinus insignis	0·06 Do.	Do.
(ii) Firewood operations ..	Rs. 3·00 to 5·00 per Metric tonnes (ton).	
(iii) Sandalwood operations	Rs. 50·00 per M. Tonnes (per ton) Includes, uprooting billeting and rough cleaning Rs. 20 per M. Tonnes (per ton) is to be spent in addition for final cleaning at the depot.	
(iv) Bamboo operations	Rs. 0·12 to 0·25 per big bamboo. Rs. 0·50 for 20 small bamboos.	

The average rate for felling comes to be 0·06 per ·00283 Cubic Metres (per cft.) for timber operations, Rs. 4 per 1·016 M. tonnes (per ton) for firewood, Rs. 50 per 1·016 M. tonnes (per ton) for sandalwood and Re. 0·02 to Re. 0·18 for bamboos.

(*c*) *Transportation from stump to road.*—This phase of logging operation is done mainly by using elephants. Some times carts dragged by bullocks or buffaloes are also employed. In case of bamboos and firewood and sandalwood at times manual labour is used for these works. The details of cost are given below for the various methods of extraction.

	Rate.	*Power used.*
(i) Timber operations.	Rs. 0·15 to 0·41 per ·20283 C. metre. (per cft.).	Elephant.
(ii) Firewood operations.	Rs. 2·00 to Rs. 5·00 per Metric tonnes (per ton)	Carts.
(iii) Sandalwood operations.	Rs. 5·00 per M. tonnes (per ton)	Carts.
(iv) Bamboos operations.	Less than Re. 0·02 per bamboo.	Head-loads.

(*d*) *Extraction by road to permanent lines of transport.*—This phase of logging operations is generally carried out with the help of motor lorries and rarely with carts. Wherever facilities occur, the motor lorries are taken direct to the stump site itself for loading and in this case, the expenditure in the last phase of the logging operations viz., transportation cost from stump to road, does not arise. Where the roads are too narrow or with sharp bends or where the logs are too

long to be loaded in the lorry or where there is difficulty in securing adequate number of lorries to transport the timber, carts are used for transport. The details of cost are furnished below :—

	Rate per kilometres. (per mile.)	*Power used.*
(i) Timber operations.	Re. 0·02 to 0·03 per .0283 Cubic metres. (per cft.)	Motor Lorry (rarely cart)
(ii) Firewood operations. (iii) Sandalwood operations. (iv) Bamboo operations.	Re. 0·40 to 0·75 per 1·016 Metric tonnes (per ton).	Motor Lorry or cart.

(*e*) Cost of transport up to 10 Kms. on permanent lines of transport; the details are furnished below :—

Motor lorry.	*Railways.*	*Boats.*
(i) Timber	Re. 0·12 to 0·30 per ·0283 (per cft.).	Generally not transported.
(ii) Firewood. (iii) Sandalwood. (iv) Bamboo.	Rs. 2·00 to 3·60 per 1·016 M. tonnes (per ton.).	Re. 1·00 to 0·50 per 1·016 M. tonnes (per ton) for firewood and bamboos, sandalwood not transported.

(*f*) Cost of transport up to 50 Kms. on permanent lines of transport.

Motor lorry.	*Railways.*	*Boats.*
(i) Timber,	Re. 0·60 to 1.00 per ·0283 C. metres (per cft.)	Generally not transported.
(ii) Firewood. (iii) Sandal wood (iv) Bamboos.	Rs. 10·00 to 18·00 per 1·016 M. tonnes (per ton)	Rs. 6·00 to Rs. 7.50 per 1·016 M. tonnes (per ton) for firewood and bamboos sandal-wood is not transported.

Motor lorries are generally used to transport the timber and other forest products. Wherever facilities for water transport occur like the Buckingham canal along the East Coast, advantage is taken of them as it is the cheapest than that by motor lorry the use of the Railways for transport is generally not made by the ordinary merchants because of the difficulties in obtaining the required number of wagons for transport. The shortage of rolling stock in railways, force the merchants to register their requirements and wait for them. Where immediate transport has to be done, the merchant always resorts to the motor lorry transport.

SECTION C.

INDIGENOUS SUPPLY OF ROUND WOOD.

I. *General Information.*—The forests in this State are managed generally on the principles laid down in the National Forest Policy of 1952. Even though, "Forests" is a State-subject, in view of the larger interests of the country, the Government of India is able to correlate the policies of the States in certain directions by giving them subsidies for the various schemes programmed on an all India basis under the Second Five-Year Plan, foreign aid programmes and others. The State, in turn, has caused the drafting of working Plans for its forests and co-ordinate their programmes of works in accordance with the various schemes of Government of India.

The period of these working plans varies from 10 to 15 years. Under item 3 of Section 'A', "Forest Resources", the various systems practised in this State have already been described. The plan of fellings for each year is based on the felling programme given in the respective working Plans or schemes formulated for the particular forests. Thus though no over all national felling plan has been formulated, adequate safeguards have been laid down to ensure that the fellings are well within the permissible limits.

Generally, the net growth of the forests is slightly in excess of the fellings as can be seen from the statement given in item 3, Section-A. "Forest Resources". In some of the private forests which were recently taken over by the State, due to unregulated fellings in the past, the fellings may be in excess of the increment put on the crop.

II. *Indigenous supply of industrial wood.*—Tables 1 and 2 have been prepared and sent separately. The data furnished in each table is discussed below :—

Table 1.—As conifers were introduced on an experimental scale, they were not exploited till 1955-56. Some of the areas had to be felled from this year onwards as the plantations have reached physical maturity. There has been a steady rate of exploitation of teak and other broad-leaved species from the forests.

The small yield during certain years is only due to the year stocking in the areas exploited. The large yield of sandalwood during the last 6 years is mainly due to large scale exploitation from vulnerable areas of the dead trees with a view to extracting them quickly before they are stolen. The number of transmission poles produced mainly depend on the number of poles available from the thinning operations in the State or areas clear-felled.

Pulpwood and pitprops are not produced at present in the State.

Table 2.—As Already stated in the note under this table, no detailed sampling could be undertaken. The Technical Assistant who was to take up this work did not join duty and so the figures already collected by the Range Officers were used. The Range Officers of the tract have a knowledge of the forests and the timber wealth of tract for which they are reporting and have furnished the yield figures from these areas after ascertaining the details from the owners of the forests and other sources.

As pulpwood and pitprops are not produced in the State, nil data has been furnished.

III. *Indigenous supply of fuel wood and charcoal.*—Some negligible quantity of firewood less than 500 cft. was removed after conversion from the lop and top ends of conifers felled from 1955-56 onwards. As in the case of broad-leaved saw and veneer logs, the firewood production had been steady and the small yield during certain years is mainly due to poor stocking in the area exploited.

The firewood equivalent of charcoal produced has also been calculated and added to the firewood produced. The conversion factor used is 4 fuel wood—1 charcoal.

The data for Tables 11 and 12 regarding recorded and unrecorded production have been filled up.

The details of unrecorded production have been collected in the same manner as for table 2.

IV. *Indigenous supply of bamboo and palm trees.*—Tables 10 (a) and 10 (b) have been filled up for recorded and unrecorded production of bamboo and palm species. The details for unrecorded production have been collected in the same manner as for Table 2.

Flow of internal trade in round—Main directions of current internal trade.—(*a*) *Saw logs.*—There are four timber sale depots maintained by the Department, one each at Pollachi, Kargudy, Cumbum and Nagercoil. The timber produced by the Department is marketed through these timber depots only, besides the timber sold standing. In addition, Madras is another important centre for timber and other products.

At present, in Madras State, Pollachi is the most important timber market besides Madras. In addition to that marketed by the Department, timber from the private and State forests in (Kerala State) also find their way to Pollachi. The timber merchants from Kumbakonam, Thanjavur, Tiruchirappalli, Coimbatore, Salem and Madurai purchase their timber at Pollachi for sales at their respective places.

The main outlet for Kargudy depot used to be Mysore State, even though the Depot is within this State. But now the merchants from West coast also purchase their needs at this depot. In view of its peculiar location, this depot serves only to a limited extent the needs of this State.

The Nagercoil timber depot is a new acquisition after the re-organisation of the States on 1st November 1956. The timber sold in this depot and those that come from the private forests in Kanyakumari District and those of Kerala State, find their way to the markets of Madurai, Ramanathapuram and Tirunelveli districts only.

Since Madras is an important timber consuming centre, timber from all the surrounding tracts including those from Pollachi, Mysore, Nagercoil, Kerala and the Andhra Districts find their way to this market. Certain amount of teak from Burma, matchwood and constructional timber from the Andamans are also imported into Madras. A timber Depot at Madras has been set up by the Andamans Forest Department to popularise their timber species through local sales.

(*b*) *Veneer logs.*—Since there is no plywood industry in this State only match industry makes use of the Veneer logs. There are several match factories run on a cottage industry basis in several districts of the State, viz., Madras, North Arcot, Salem, Coimbatore, Tiruchirappalli, Madurai, Ramanathapuram and Tirunelveli, and one big mechanised factory owned by the Wimco's at Madras. •Oceling machines have been set up in Madurai, Tiruchirappalli, North Arcot, Salem districts and in Madras. The timber for those factories are obtained locally and some import them from the West Coast (Kerala State) and the Andhra States also. Considerable quantities are procured from Andamans. The production in this State is meagre, due to short supply of matchwood. Steps have now been taken to form match-wood plantations.

(*c*) *Pitprops and* (*d*) *Pulpwood.*—These Industries do not exist in this State.

(*e*) *Other.*—A certain quantity of round wood is utilised locally for constructi onal purposes (e. g.) houses, bridges, furniture, etc. The wood for these purposes is generally obtained locally from the freshly felled trees or market.

The transmission poles of teak and other species obtained from the forest divisions bordering Kerala State are utilised at the various places in the State for communications.

The indigenous coastal boat industry at Tuticorin, Nagapatinam, Porto Novo, Cuddalore, and Madras use a certain quantity of round wood of *Tectona grandiz* (teak), *Thespecia Populnea* (portia tree), *Artocarpus hirsuta* (*aini*) *Lagestreomea lanceolata* (Venteak) *Calaphyllum tomentosum* (Poon) and others. Fishermen use *Melia dubia* (Malaivembu) and other species as Catamarans for fishing along the coast.

(*f*) *Firewood.*—The movement of firewood is generally localised. Important consuming centres such as big cities and industrial towns draw their supply from the adjoining areas. Cities like Madras, which consume large quantities, receive their supply even from distant districts like Thanjavur, in addition to what is brought from the neighbouring districts, including those of Andhra State, by road, canal and Railways. The Buckingham canal is an important channel for firewood transport, being the cheapest of all.

(*g*) *Bamboos.*—The poor man's timber bamboo, is used mainly for constructional purposes in the villages, towns and cities in this State. In addition they are used for scaffolding, tent-poles, ladders, "lathis", lance shafts, pandals, etc.

Bambusa arundinacea and Dendrocalamus strictus.—(bamboos) are available in the forest that adjoin the Kerala State, the Javadis, the Chiteris, the Thenmalai and others. In addition, large quantities are imported from the Kerala and Andhra State also. Besides that consumed locally at the production centres, the bamboos flow towards the coastal districts to meet the demand there, as bamboos are not grown or available in sufficient quantities in the coastal districts.

With the establishment of the paper mills at Bhavanisagar and Mettur in the near future, the exploitation and consumption of bamboos in the State may increase.

(*h*) *Palm species.*—The palm species are used for roof, rafters, pandals, house pists and other purposes. The palms are generally locally used, more or less near about the sites of protection. There is very little flow to particular places for special purposes.

The important palm species used are the palmyrah, the coconut and the arecanut.

2. *Distribution of forests in relation to the population.*—The details of area, population and revenue for the present Madras State are furnished below :—

			Remarks.
The total population in 1958.			
3,31,53,000			
Percentage of population in.—			These details have been based on 1951 census figures only.
(i) Rural areas ..	84		
(ii) Urban areas ..	16		
Density (number per 1·609 Kilometres per sq. mile ..		1719·76	Kilometres.
Percentage of total land area under forests		1766·45	per cent.
Extent of forests per capital in 27·435 Kilometres (10·6 sq.miles) units.		1,510	

3. *The distribution of forests in relation to general economic activities.*—The forests are badly located in the different districts. There is a larger percentage of forests in the districts adjoining Kerala State, where the western Ghats lies and in the districts where the Eastern ghats and its branches are located. Generally, the coastal districts contain less extent of forests.

The forests, as a rule, do not influence the economic activities of the people who live in the villages and towns located far away from them. Only in the villages that lie within them and near the forests, the activities of the people are to some extent influence by the Forests.

India is mainly an agriculture country, whose 70 per cent of the population depend on agriculture and other alied occupations. The people of India still depend very largely on firewood as the fuel for the hearth, and the even. The forests supply timber for various purposes small timber for the agricultural implements, firewood and a host of other minor forest products for the people including manure leaves. The intake of these products by the villagers is more or less directly proportional to their proximity to the forests.

SECTION D.

FOREST INDUSTRIES.

Introduction—In Madras State, the Forest industries do not occupy an important place in the economic life of the people, as the forests are of driver type, and are not comparatively very rich or dense. Moreover they are small in extent and lie scattered. Such forest industries as have come into existence are generally developed near the forest, where the raw material is available at economic costs. Most of them are still in the cottage industry phase and have not developed into a full fledged large scale industry.

The primary forest industries that have developed are not many. They are in order of importance—

1. Saw mill industry.
2. Match industry.
3. Essential oils industries.
4. Pencil industry.
5. Other miscellaneous industries.

In the paragraphs that follow, a brief account about the situation of these industries in 1953-55 is given. The questionnaire prescribed has been followed in furnishing the details required for the saw mill industry match industry and pencil industry. As no questionnaire has been prescribed for the " Essential Oils Industry " and " Other Miscellaneous Industries ", a quastionnaire was specially drafted for recording the information. A copy of this quastionnaire used is enclosed for information as Appendix I.

The data for filling up the questionnaire was collected by visiting all the industrial units at most of the places and at other places, by visiting a few selected representative industrial units. On the basis of the outturn, the industrial units were classified into large, and small categories and in each category, not less than 10 per cent of the factories were inspected, notes drawn up and the corresponding proportional figures worked up to obtain the correct figure. Wherever such sampling was used it has been indicated at the appropriate place.

I. *Saw Mill Industry.*—The saw mills in the State handle both primary conver sion and reconversions and there are no separate saw mills for each of them. Actually very little reconversion is done in the saw mills, and house, as such it is not possible to furnish details separately for reconversion alone.

For the puposes of collection of data, sampling was done in Madras City only. Six representative saw mills were selected out of the total 21 and the questionnaire filled up. The saw mills were grouped into large and small units for the purposes of collecting data..

1. Number of saw mills	47
Total installed capacity	About 34,650·515 Metric tonnes (34300 tons) sawnwood per annum.
Number of employees engaged in the industry.	1,334 per working day.
Number of hand sawers used	528 per working day.

2. General description of plants from *Technical* point of view—

(*a*) *Prevailing capacity.*—The prevailing capacity appears to be about one third of the installed capacity as most of the saw mills work only 8 hours. The prevailing capacity is about 11,400 tons sawn wood per annum.

(*b*) *Transportable saw mills.*—All the saw mills except one are of fixed type. The portable saw mill is at Salem.

(*c*) *Source of energy.*—Electricity, and diesel oil are used as sources of energy Electricity is the most common form of energy used. Only two saw mills used diesel oil.

(*d*) *Equipment.*—As several of the saw mills are small units, they used one or more band saws. Some of them have circular saws and frame saws also.

The Perambur (Madras) and the Golden Rock (Tiruchirappalli) Railway Workshops only have got large equipment of saws and their accessories. The details are furnished below :—

i.	Log band saws	6
ii.	Cross cutting saws	4
iii.	Circular saws	26
iv.	Resawing	6
v.	Band saws (scroll)	3
vi.	Boring machines	4
vii.	Circular saws grooving	3
viii.	Fret sawing machine	1
ix.	Dimension saw bench	3
x.	Lathes twin and copying	6
xi.	Mortioing machines	8
xii.	Moulding machines (spindle)	6
xiii.	Rounding machine	1
xiv.	Scrapping machine	1
xv.	Tenoning machines	6
xvi.	Planning machines	9
	Total ..	93

(*e*) *Degree of mechanisation.*—The degree of mechanisation varies considerably. It can be stated that no saw mill is completely mechanised and the degree of mechanisation varies from saw mill to saw mill. In the smallest unit having only one band saw, every operation is manually done except the actual sawing by machine. In some units, lifting tackles, and trolleys are manually operated. In the Railway Workshops, which appear to have the highest degree of mechanisation, with the exceptions of movements of materials from machine to machine and feeding of job to machine, all other things are mechanised.

(*f*) *Percentage of skilled workers*—It varies from 10 per cent to 40 per cent depending on the size and the capacity of the unit.

(*g*) *Training possibilities.*—As most of the units are privately owned and small, no possibilities of training exist and no attempt is made to give such training also. In the Railway workshops, a 5-year training scheme for Trade Apprentices and Mechanical apprentices exist. Trade Apprentices are being trained to work on all machines in saw mill shop, and Mechanical Apprentices are being trained in Progress Office and drawing office besides working on all machines in the shop.

(*h*) *Integration with other plants.*—The saw mills exist generally as separate units in most cases. In a few cases, they are combined with other industries as furniture making units, and others.

The saw mill units in the Railway workshops are integrated with the various other units for building railway carriages. The activities of the saw mill units are directly connected with the other phases of work in carriage building, carriage repair wagon shop, etc.

3. General distribution of the plants from the *economic* point of view—

(*a*) *Distribution of mills in the country—Their concentration, etc.*—In this State, the distribution of the saw mills appears to depend on the existence of the Timber forests at any given place except Madras. While there is at least one saw mill at most of the district head-quarters, several exist in places like Vellore (**4**), Nagercoil (9), Pollachi (3), Coimbatore (2) and Madras (22), which are not only raw material production centres but also consumption centres. The case of Madras is an exception, because, it is a big timber trade centre, which in addition to consuming large quantities of timber by itself, has also an export and import market.

(*b*) *Salient features of ownership.*—Except the saw mill units in the Railway and Public Workshops, which are Government owned, the other saw mills are privately owned singly, jointly or severally.

(*c*) *Information on marketing the products.*—Most of the saw mills under take job-works only. Rarely, the saw mills buy the logs, convert them into sizes and sell them. In the Railway workshop, the products of manufacture are consumed there itself for the carriage, building works.

Similar is the case with public works Department Workshop. The by products as saw dust and scrap timber pieces are sold in open auction. So, marketing of the products of manufacture at the saw mills do not arise.

(*d*) *Details regarding hand sawing enterprises.*—In some of the saw mill units, where facilities for cross cutting do not occur, hand sawing is employed on piece-work system.

(*e*) *Influence of foreign capital on existing plants.*—All the saw mills are Indian-owned only.

(*f*) *Direct or Indirect support of the industry by Government, i.e.*—reduced taxes, high import duties to sawn wood, low import duties for saw mill machinery, loans to saw mills at low interest, financial help for exports, quantitative restriction of imports, Government planning of production, etc.

This industry does not receive much support, directly or indirectly, from the Government. Under the Second Five-Year Plan, in order to encourage small scale industries, loans are given by the State Government in cases where new saw mill units are being set up. The industrial Estate at Guindy offers all technical advice and help to the industry wherever asked for. Import of timber and wood manufactured articles from foreign countries are controlled by the import policy of the Government of India enunciated from time to time for each half-year. Due to want of adequate foreign exchange, such imports are restricted to the minimum, if not, banned completely at times. The Revenue Customs Duty levied on the imported wooden articles also keep a check on their prices.

4. *Main coniferous and broad leaved species used.*—Very little of coniferous timber is used in these saw mills. *Pinus insignis* was the only conifer used. The broad leaved species, given below, are used generally in these sawmills.

Trade name.	*Botanical name.*	*Remarks.*
Pillamarudu.	Terminalia paniculata.	
Venteak.	Lagerstroemia lanceolata.	
Karimarudu.	Terminalia tomentosa.	
Teak.	Tectona grandis.	
Rosewood.	Dalbergia latifolia.	

Trade name.	*Botanical name.*	*Remarks.*
Vengai.	Pterocarpus marsupium.	
Thadasu.	Greweia tilaefolia.	
White cedar.	Dysoxyoum malabaricum.	
Poon.	Calophyllum tomentosum.	
Red cedar.	Cedrella toona.	
Manjakadambu.	Adina cordifolia.	
Jack.	Artocarpus integrifolia.	
Aini.	Artocarpus hirsuta.	
Vagai (Vakai).	Alibizzia lebbek.	
Thani.	Terminalia belercia,	
Kalpine.	Dipterocarpus indicus.	
Mango.	Mangifera indica.	
Poola	Bombox malabaricum.	
Vedankorana.	Stercospermum xylocarpam.	
Silver ooak.	Grevillia robusta.	

It is really difficult to estimate with any known percentage of accuracy, the percentages of the various species used in the saw mills, as no account is kept in the mills according to the species sawn by them. A rough estimate, however, is given below :—

	PER CENT.
Pillamarudu	25
Teak	20
Venteak	15
Other woods	40

5. Outturn on conversion of one cubic meter of round wood for coniferous non-coniferous, mill and hand-sawn timber.

In case of coniferous timber, a higher cut-turn than broad leaved species was obtained. Among the non-coniferous timber, the cut-turn depended on the sizes required to be cut out of the round logs. The smaller the size, the higher the percentage of cut-turn. The cut-turn will generally be less in case, of small sizes for hand-sawn timber than for mill-sawn timber, the average quantity of sawn wood obtained by conversion of one cubic meter of saw logs is given below:—

Class of timber.	Mill-sawn.	Hand-sawn.
Broad-leaved.	55 per cent to 75 per cent in volume.	50 per cent to 65 per cent in volume.
Coniferous	60 per cent.	Not tried.

6. *Saw mill wastes produced and their disposal.*—The saw mill waste consists of saw dust, off-cut and end pieces. This waste varies from 25 per cent to 45 per cent according to the straightness, soundness and quality of the logs and the nature of the sizes converted. Saw-dust rarely exceeds 5 per cent of the volume of the log and the rest are end pieces only,

As the saw mills are run by electricity or diesel oil, the saw mill waste are not consumed in the saw mills themselves, but they are sold to outsiders. Sawn dust is generally used in ice-factories. The off-cut and the end pieces are used as firewood.

7. Statistics—Table 3 }
8. Statistics—Table 4 } These have been completed and the details already furnished at the appropriate places.

9. (*a*) *Raw material supply adequate or not.*—No difficulty is experienced in the supply of raw materials for the saw mills. Whenever, there was difficulty in getting the round logs locally, they were obtained from the neighbouring tates.

(*b*) *Procurement of raw material.*—There is no State obligation to supply these logs for conversion. The Saw mill owner have to make arrangements for the logs for sawing. As most of the saw mills depend on job-works only, they have no difficulties in procuring round wood for cutting. The round logs brought to their factories are sawn to the required sizes and delivered to them. In case of saw mills which require the round logs for conversion into sizes for use in their own other units as furniture shops, railway carriage and wagon building, these saw mills make their own arrangement to purchase the logs in open market. The saw mill units in the Railway workshops and Public works Department workshops, get their supply of round logs from the State Forest Department at definite rates fixed by the Government. When the State Forest Department is unable to meet their full requirements, purchases from the open market are also resorted to.

10. *Future development programmes.*—The second Five-Year Plan in which emphasis has been laid on all-round industrial development, will pave way for better development of the saw mill industry also. At present, this industry wholly lies in the "private sector" and the difficulties to be overcome by this industry in order to achieve its fuller development appear to be many. The import restrictions on the spare parts for the saw mill equipment and the limitations in the use of electrical energy, which is the prime motive force for running the saw mills are some of the bottle necks which the industry will have to overcome in the near future. The prospects of improvement in the near future do not appear to be rosy; but with the overall industrial development of the country, especially after the Bhilai, Rourkela, Durgapur and other iron and steel companies go into full production, locally manufactured saw mill equipment will be available. So, will be the case with electricity when all our hydro electric projects are brought to bear fruits.

II. *Veneer Industry.*—This industry has not yet been developed in this state.

III. *Pulp Iudustry*:—There is no pulp industry in Madras State.

IV. *Paper Industry and Paper Board Industry* —

1. Number of plants.	..	There is only one by name East India paper Mills Ltd., Madras.
Total installed capacity	..	The total installed capacity per annum is 30,48·15 Metric tonnes (3000 tons) of waterproof paper made from kraft paper purchased from outside.
Number of employees.	..	39.

2. *General Description of the plants from the Technical point of view.*—

Prevailing capacity.	..	2540·175 Metric tonnes (2500 tons) of waterproof paper made from outside.
Cottage industry.	..	This is not a cottage industry.
Energy used.	..	Electricity and coal.
Equipment.	..	There are three units of machinery in the factory. The components of these machinery are: Bitumen melting type, Rollers, Coating and spreading machines, and processing machines.
Percentage of skilled workers	..	74 per cent.
Integration with pulp mills etc.	..	This factory is a separate unit and is not integrated with pulp or any other mill.
Varieties of paper produced	..	The various kind of packing and wrapping papers produced are: (1) waxing paper, (2) Bitumions paper with gunny (3) Ocean kraft paper and (4) thread lines paper.

3. *General description of the plants from the economic po int of view.*—

Location of mills within the country ..	This is the only factory connected with pape industry. Even this is not producing any paper from the raw materials. There is no other paper mill in this state.
Ownership ..	It is a private limited firm.
Marketing ..	Sales of the manufactured paper are carried out through agents as well as direct.
Influence of foreign capital ..	Nil.
Direct or indirect support of the industry by Government ..	Nil.
Government Planning of the production etc. ..	Nil.
4. Indicate (*a*) If raw material supply in recent years was ample of if there were any difficulties regarding the current indigenous supply of pulp ..	There has been no difficulty in supply of raw material.
(*b*) Indicate pulp producement procedure. ..	The raw meterial viz., kraft paper is purchased from the following paper mills: Mysore Paper Mills, Bhadravati, Punalur Paper Mills; Punalur, Orient Paper Mills, Brijrajnagar, Orissa, Rhotas Industries Ltd., Dalmianagar.

5. *Complete Statistics.*—The details production from 1953 to 1955 are given below :—

	Packing and wrapping paper.	*Other paper.*
1953	1,214.179 Metric tonnes. (1195 tons).	183.905 Metric tonnes. (181 tons).
1954	1,623.648 Metric tonnes. (1958 tons).	246.900 Metric tonnes. (243 tons).
1955	2,111.352 Metric tonnes. (2078 tons).	238.772 Metric tonnes). (235 tons).

6. *Furniture expansion or development programme.*—No definite programme exists. It will expend according to necessity.

V. *Fibre Board Industry.*—No such industry has been set up in this State.

VI. *Match Industry.*—This is an important forest industry developed in this State. There were 100 match factory units in this State during the period 1953–55. Out of this, only the Western India Match Factory at Madras is a fully developed Match Factory, which manufactures its match box from the round wood to the finished product for sale. The other 99 factories either produce splints and match boxes only or dip the splints after purchase, label and make the match boxes. Out of these 99 units, 9 of them make splints and boxes and the rest 90 units are only dipping units, developed on cottage industry basis. While even the "splint" factories use some machinery for peeling and cutting, the "dipping" factories use little of machinery and can truely be called cottage industries.

The number of mazdoors engaged daily in this industry is 47,632, as detailed below :—

		PERSONS.
(i) Combined unit	(1)	1,768
(ii) Splint units	(7)	590
(iii) Dipping units	(92)	45,274
Total		47,632

More than 4/7 of the mazdoors employed in dipping units are only part-time workers.

2. General description of the plants from the technical and economic point of view—

(*a*) *Equipment.* –The equipment of these units varies, from the primitive grinding stone vats of the " dipping unit " to the modern machinery used by the WIMCO. The details of the machinery used in the various units are given below:—

(i) *Combined unit*:—Wood cutting, wood peeling machines. vencer and splints chopping machine outter and inner box making machine, automatic box dryers, splint dryers, polishing drums, splint cleaning sieving machine, continuous machines for dipping sticks, box closing and filling machine, band rolling and levelling machines, friction painting machines, dozen packing machines, ball mills for preparation of head and protection composition, are the various machines used. The source of energy used is electricity.

(ii) *Splint Units.*—Pelling, levelling, cutting and chopping machines are used in the manufacture of splints and boxes. The motive power is supplied by either electricity or diesel oil.

(iii) *Dipping units*—.The grinding machine for chemicals, is operated either by electrically driven motors or by manual labour. The mixing, dipping, levelling ,packing, etc., are done by manual work.

(*b*) Percentage of skilled workers :—

Category of unit.

Class.	*Combined unit.*	*Splint unit.*	*Dipping unit.*
Skilled workers.	8.7 per cent	5 per cent to 12 per cent	27 to 50 per cent
Semi-skilled workers.	52.5 per cent	Nil.	Nil.
Unskilled workers.	38.8 per cent	95 per cent to 88 per cant	73 to 50 per cent.

The percentage of skilled workers depends on the location and type of the factory. In case of dipping units, very large number of labour employed are only part-time workers and this phase of the industry has become a well-developed cottage industry unit. The part-time workers are supplied the splints and the dipping frame for setting the dipping frame during the leisure hours in their homes. These workers are paid on the quantum of work turned out by them.

(*c*) *Integaration with otherunits.*—The combined unit of the WIMCO is a full fledged industry by itself. In one case, the splint unit has been combined, with the "Rice hulling machiner" and the other splint units are functioning separately. The dipping units function separately and also as combined units. In some cases, they are combined with "Litho printing" and "paper cutting machiner" in order that the necessary lables for the match boxes may be printed. These printing machinery are used to execute other printing works also.

(*d*) *Situation of plants within the country*—The WIMCO is located near Madras. In the initial stages, as the WIMCO were importing their plints, and Madras was a big consumption centre, it was chosen as the proper site for the factory. The location of the splint units appear to depend on the availablity of raw materials for the manufacture of splints and thus they are situated close to the importent forest areas in the districts of the state, viz., Salem, North Arcot and Madurai.

The dipping units are concentrated in the Ramnathapuram, Madurai and Tirunelveli districts. The climate of the tract appears to be eminently untable for the devolopment of these units on cottage industry basis.

(e) *Ownership.*—Most of these units are owned singly or jointly by private individuals. The combined unit WIMCO is a registered company with foreign capital. All the splint units are privately owned, Among the dipping units, four are privately owned limited c)mpanies and the rest are individually owned.

(f) *Marketing.*—The marketing of the manufactured articles is done by the producers themselves at the various places.

(g) *Influence of foreign capital.*—The WIMCO is owned by a Swedish Company which invested the necessary capital. At present, the company's capital includes Indian Investment also. The other match units are Indian owned.

(h) *Direct or indirect support by Government.*—The match units that have been developed on cottage industry basis have been given the full support of the Government for their proper development. As most of the "dipping units" are "B" class factories, they are given a rebate on the excise duty paid by them and the excise duty band rolls are supplied to them on credit basis. The Government of India have also declared that all additional demand for matches in the next 5 years will be met only by the expansion in the cottage industry section, and that the Government will also assist them by setting up training facilities, research facilities and marketing depots.

The other mechanised units do not get any support, direct or indiriet, from the Government.

(i) *Government planning of production, etc.*—The State Government have large scale plants under implementation for planting species suitable for match production to ensure adequate supply of raw material. They have also programmes to set up units to demonstrate the use of various indigenous and locally available materials as bamboos which could be used as splints for matches. The unit at Gandhikedan (Madurai district) has alreaby gone into production. There are already proposals to set up another 12 such units at the various places in the State.

3, *Estimate of round wood used.*—The quantity of round wood used to manufacture match boxes is about 54866.25 Metric tonnes (54,000 tons) annually during the period 1953–55. Out of this, the wood used by the WIMCO is about 14,224.25. Metric tonnes (14,000 tons). The balance about 40,642 Metric tonnes (40,000 tons) is used by the cottage industry, itcluding those used for manufacture of coloured match boxes used in pyretechnica. Separate figures for ordinary match boxes are not available in the case of cottage industry units, Out of this 54,866.25 Metric tonnes (tons) of matchwood used, it is estimated that about 10,169.5 Metric tonnes (10,000 tons) (7,112.35 Metric tonnes) (7,030 tons) for cottage industries units and 3,048.15 (3,000 tons), for WIMCO would have been procured from this State and the balance 44,706.2 Metric tonnes (44,000 tons) from outside this State.

The various species used for matchwood are: Salmalia Malabarica, Machilus Macarantha, Mangifera India, Vateria Indica, Cyrocarpus Jaqaninii, Alstonia Scholaris, Sesbania Grandiflora.

4. *Raw meterial supply.*—In this State, due to forests, there is always inadequate supply of raw material. The demand for raw meterial is met by imports from the adjoining States as Kerala, Andhra and Mysore. Of Late, considerable supply is obtained from the forests of the Andamans also.

The difficulties in securing adequate raw materials supply for the industry is mainly due to improper location of the factories. There were always difficulties for the poor cottage industry units in securing adequate raw material for their use, as they could not complete with the well established pioneer in the field, WIMCO. Of late, the Government have intervened and pooled the available raw material resources and distribute them according to the needs of the various match factories.

While the Government forest supply bulk of the raw materials considerable quantities come from the trees on the private lands also.

5. *Future expansion of development.*—Since the present annual capacity of the match factories, is more than the existing demand there is no need for any organised development in the near future. During the next 5 years, the cottage industry units will be encouraged to step up their production.

VII. *Other primary forest industries.*—The important primary forest industries which have not yet been described are—

A. Essential oil industry.

B. Quinine manafacture industry.

C. Pencil industry.

D. Wood treatment plant.

To collect the information with regard to the above industries, suitable questionnaires were drafted. The information collected is described below :

A. *Essential Oil Industry.*

Among the various essential oils manufactured in this Stste, those of commercial importance are :—

(i) Sandalwood oil and (ii) Eucalyptus oil.

The other essential oils that are manufactured in negligible quantities are geranium oil, lemongrass oil and others. The details with regard to the commercially important essential oils are described in the paragraphs that follow :—

I. *Sandalwood oil*

Number of distillation units.—During 1953–55, there were only three sandalwood oil distillation units in working condition in this State, one each at Salem, Mettur and Tirupattur (North Arcot). The unit at Tirupattur (North Arcot district) was closed down about two years ago.

Total installed capacity—Both the units can distil about 5,080.025 M. (500 tons) of wood per annum.

Number of employees engaged in the industry Fourteen per day.

2. *General description of the plants from a technical point of view.*—The sandal wood oil is extracted from sandalwood converted into chips and dust, by steam distillation. The various mechines used are furnished below : —

(1) Disintegrators with motors.

(2) Chipping machines with motors.

(3) Wood splitting machine.

(4) Knife grinding machine.

Modern tube boilers and other accessaries to generate steam. Several stills with condensors and collecting pots.

Redistillation and drying plant with super heater. Prevailing capacity 21,775·32 Kilograms (48,000 lb.) of oil or 487·704 Metric tonnes (480 tons) of sandalwood per annum. They are fixed units.

Source of energy.—Electricity, diesel oil and steam are used. The chips and dust are partly consumed in the boilers and partly used for other purposes.

Degree of mechanisation.—Mechanisation has been done only to a limited extent Handling of sandalwood chips, bottling, lebelling, etc., are done by manual labour.

Percentage of skilled workers.—About 30 per cent. Training possibilities: There are no training possibilities in these units. Integration with other units; There are separate units. Yield of Oil; Generally roots yield more oil than the serials portions. Sapwood yields only small percentage of oil. The average yields of different varieties are given under item number 6 (six).

3. *General description of lands from the economic point of view—Distribution of mills in the country.*—There are only two mills in Salem district, which is only one of the sandalwood producing tracts. There are no mills in Coimbatore district which is not only a sandalwood producing area but also has sale depot. Concentration according to consumption centre, etc.

As the sandalwood sale depots are located in Satyamangalam (Coimbatore district) and Tirupattur (North Arcot district), these places will be ideal in view of availability of raw meterials. Since the sandalwood oil produced is exported to foreign countries, the finished products are exported through Madras Port.

Salient features of ownership.—All the three are privately owned companies. Information on the marketing of produce: The produce is sampled to ascertain its qualities and marketed through their agents in the various foreign countries as the United States of America, the United Kingdom, Japan and China. In India, the oil is sent to Bombay, Calcutta and Utter Pradesh also. Details regarding the small scale industries; There is very little small scale distillation developed on a cottage industry basis due to difficulties in getting adequate quantities of raw meterial, the high cost of the raw meterial and difficulties in marketing the oil produced due to price fluctuation and other reasons.

Influence of foreign capital.—No foreign capital has been invested in these factories. Direct or indirect Governmental support to industry: In order to maintain the quality of the oil produced "Agmark grading Certificated" are issued by the Government of India as a guarantee to the foreign purchaser. This is enforced in case of oil exported to foreign countries only. To help the producer, the Government of India have brought out the Indian Standard Specification for Sandalwood oil I.S. 329—1952, giving the details of the qualities of genuine sandalwood oil.

In view of the high prices fetched for oil, the Madras Government is considering the proposal of establishing a monopoly in sandalwood oil, in colloboration with the Mysore State.

4. Chemical constitution of the product, etc. I.S. specification for sandalwood oil (I.S. 329–1952) given the requirements for sandalwood oil as below.

Characteristic. (1)	*Requirement.* (2)
(i) Colour	Pale yellow or nearly colourless.
(ii) Odour and taste	Characteristic faint but persistant.
(iii) Specific gravity at—	
(a) 25/25° C 0·965° to 0·980°.	
(b) 30/30° C 0·962° to 0·976°.	

Note.—Specific gravity for each degree centigrade rise in temperature is 0·00070.

(iv) Optical rotation	15° to 20°
(v) Refractive index at	
(a) 25° C	1·5010 to 1·5080.
(b) 30° C	1·4990 to 1·5060.

Note.—Refractive index for each degree centigrade rise in temperature is 0.00039.

(vi) Esters as Santalol acetate (617 H26 O2) per cent by weight, min.	2.
(vii) Free alcohols calculated as Santalol per cent by weight, min.	90

5. Name of main species used : Santalum álbum—Mainly heartwood and sapwood to a limited extent.

6. Nut-turn etc. : One ton of sandalwood heartwood will yield 43·091 to 49·895 Kilogram, (95 to 110 lbs.) of sandalwood oil according to their quality as given below.

Class of sandalwood.	Oil yield per ton.
(1)	(2)
Roots I class	52·163 to 56.699 kilogram- (115 to 125 lbs.)
II class	56·699 to 58·967 kilograms (120 to 130 lbs.)
III class	58·967 to 63·503 kilograms (130 to 140 lbs.)
Billets	45·359 kilograms (100 lbs.)
Jajpokal	47·627 kilograms (105 lbs.)
Chips	34·473 kilograms (76 lbs.)
Chilts	23·576 kilograms (63 lbs.)

7. Wastage produced and its utilisation : Wastage is 94 per cent in volume in the form of chips and wood. These are generally used as fuel for the boiler. At times, it is also converted into scented dust and marketed.

8. (a) Supply of raw material. The supply of raw meterial for distillation is restricted considerably due to export of heartwood as such to foreign countries. As the quantity of sandalwood produced is fixed, it is not possible to increase the supply of wood for distillation.

(b) (c) Procurement of raw meterial : Raw meterial is purchased from the Forest Department in open auctions held twice or thrice in a year. The Government have no obligation to supply any wood to the merchants. The prices bid at the auction depend on the ruling prices for oil in Europe and other foreign markets. Private merchants also sell the sandal wood in their fields to these factories. About 90 per cent of the raw meterial is purchased from the forest Department and the balance 10 per cent from private merchants.

9. Future expansion programme: Till the quantity of sandalwood produced is increased, there is not much scope for any large scale expansion programme.

II. Eucalyptus oil.

1. (a) Number of distillation units: There are 70 distillation units on cottage industry basis. There is also a steam distillation unit at the Cinchona Factory, Naduvattam, which distills several other oils also in addition to Eucalyptus oil, according to demand.

(b) Total installed capacity : All the units can distil about 47,354·796 kilograms (144,000 fluid lbs.) of oil per annum.

(c) Number of employees engaged in the industry : 160 persons per working day.

2. General description of the plants from the techinical point of view—

(a) Prevailing capacity : Since the industry is mainly on cottage industry basis, the installed capacity equals the prevailing capacity. Whenever necessity arises, more units are added to the existing units to the required extent.

(b) Transportable units : All are fixed units.

(c) Source of energy : Firewood is used in generate steam for distillation.

(*d*) *Details of equipment.*—The various equipments used are—

Distillation drums, to hold the leaves and water, a spiral condenser, a drum to hold the spiral condenser, jars to collect eucalyptus oil and connecting tubes.

(*e*) In case of the Cinchona distillation unit, gauges to indicate and valves to control the pressure of the steam, re-distillation units, decolonisation units and other factory adjuncts are also used.

(*f*) *Degree of mechanisation.*—In the cottage industry units, all labour is done manually. In the Cinchona unit, mechanisation has been done partly only. There also manual labour is employed to a large extent.

(*g*) *Percentage of skilled workers.*—50 per cent.

(*h*) *Training possibilities.*—Nil.

(*i*) *Integration with other units.*—The cottage Industry units exist as separate entitles. The Cinchona unit forms part of the Cinchona factory for manufacture of quinine.

3. General description of the plants from the economic point of view—

(*a*) *Distribution in the country, etc.*—Those oil distillation units are mainly concentrated in and around Ootacamund and Coonoor within a radius of about 10 miles. The cinchona unit only is situated at Naduvattam. Their location is mainly because of the availability of raw material in this tract, where eucalyptus thrives well.

(*b*) *Sailent features of ownership.*—Except the Cinchona unit, which is owned by the Madras Government, the other units are privately owned.

(*c*) *Marketing.*—The produce is generally marketed at Coonoor and Ootacamund, from where they are sent to out stations on demand.

(*d*) *Influence of foreign capital.*—As all the units are Indian-owned, there is no foreign capital.

(*e*) *Government support to Industry.*—As the Industry is a well established cottage Industry, no Government support, direct or indirect, is given. Since the industry is able to meet the existing demands of the country, Government have not get any definite plans of expansion.

4. *Chemical Constitution.*—The Indian Standard Specification for oil of Eucalyptus (revised)—I.S. : 328—1957 has published the requirement for oil of Eucalyptus as below :—

Serial number and characteristic.	*Requirement.*
i. Colour and appearance	Colourles or pale yellow liquid.
ii. Odour and taste	Characteristic aromatic camphoraceious odour; pungent and camphoraceous taste followed by sensation of cold.
iii. Specific gravity at—	
(*a*) 25°/25°C	0·9605 to 0·9075.
(*b*) 30°/30°C	0·8965 to 0·9035.

NOTE.—Correction factor specific gravity of each degree centigrade rise in temperature is—0·00084.

iv. Optical rotation	50 to 10°.
v. Refractive index at—	
(*a*) 25°C	1·4570 to 1·4678.
(*b*) 30°C	1·4548 to 1·4656.

NOTE.—Correction faster for refractive index for each degree centigrade rise in temperature is 0·00044.

vi. Cineole content, per cent by weight, in 60.

5. *Main species used*—*Eucalyptus clobulus* is the species used to extract the eucalyptus oil.

6. *Yield.*—About 45·359 kilograms (100 lb.) of green eucalyptus leaves will yield about 396·893 grams (14 oz.) of eucalyptus oil. Under controlled temperature and pressure, nearly 453·592 grams (16 oz.) of oil are obtained at the cinchona unit.

7. *Wastages.*—As oil is extracted by steam distillation, the bulk of the leaves, i.e., more than 99 per cent in weight comes out as waste and they are used as fuel in the distillation unit itself.

8. *Raw material supply.*—There is no dearth of raw material required for the industry. The distillers enter into agreements with the owners of blue gum trees for the removal of leaves annually on payment of value. The bluegum trees in the Reserved Forests are also sold in auction every year before the trees are clear felled for firewood in the fuel coupes.

9. *Future development.*—As the industry is on cottage industry basis, there is no planned programme of expansion of their activities. The number of units in operation fluctuate according to the demand for oil in the market. So, it is difficult to state in definite terms what the future programmes will be as the market is a fluctuating one.

B. Quinine Manufacture Industry.

1. (*a*) *Number of distillation units.*—The Government Cinchona factory at Naduvattam and Valparai are the two units in this State.

(*b*) *Number of employees engaged in the industry.*—70 per day.

2. General description of the plants from the technical point of view—

(*a*) *Prevailing capacity.*—The factories are not working to its full capacity, as there is no such demand for the manufactured products. An idea about the prevailing capacity can be obtained from the average production figures for the 1953–55 period given below:

Quinine Sulphate	7,066·932	kilograms	(15,580 lb.).
Cinchona febrifuge	4,671·997	,,	(10,340 lb.).
Quantity of bark worked ..	297,822·658	,,	(656,590 lb.).

(*b*) *Transportable unit.*—The factories are a fixed unit.

(*c*) *Source of energy.*—Steam generated by using firewood is the main source of energy.

(*d*) *Details of equipment.*—Various machines are used to extract the quinine from the bark. The most important of them are Crusher, mixer, alcholic distillation units, fractional distillation units, chemical mixers, evaporation units, decloourishing units, re-distillation units, tablet making units, and other factory adjuncts.

(*e*) *Degree of mechanisation.*—The factory is partly mechanised only.

(*f*) *Percentage of skilled workers.*—30 per cent.

(*g*) *Training possibilities.*—There is no scope for training the workers as the technical side of the processing has to be attended to by chemists only.

(*h*) *Integration with other units.*—The essential oil distillation unit is also integrated with this factory.

3. General description of the plants from the economic point of view—

(a) *Distribution in the country.*—There are only two factories as there is not much demand for quinine in the country. The location of the factory has been made at Naduvattam and Valparai where the tree which produces the bark used as raw material, grows. As the raw material is a bulk produce, in order to avoid unnecessary transport, the factories have been located at Naduvattam and Valparai.

(b) *Salient features of ownership.*—The factories are owned and run by the Madras Government.

(c) *Marketing.*—As there is not much demand for the produce, there is considerable difficulty in marketing the produce. The latest synthetic drugs in the market for malaria have reduced the demand for quinine from the public.

(d) *Influence of foreign capital.*—The factories are owned by Madras Government and no foreign capital is involved.

(e) *Government support to industry.*—In order to increase the sales of quinine all the Government Medical institutions purchase their supplies from this factory. Sales to the public is also arranged through post offices by entering into agreements with them.

4. *Chemical constitution, etc.*—The quinine sulphate and allied products are alkoloide extracted from cinchona bark.

5. *Main species used.*—Cinchone robusta and hybrid.

6. *Yield.*—45.4 kilograms (100 lb.) of bark will yield 5 per cent to 6 per cent alkaloids, of which 3 per cent will be quinine.

7. *Wastages.*—About 95 per cent of the barks is thrown out as waste. No use is made of this waste.

8. *Raw material supply.*—The Government Cinchona plantations near about the factories at Naduvattam and Valparai supply the necessary raw materials. As and when trees are cut, fresh trees are grown to replace them so that supply of bark can be ensured in a sustained manner.

9. *Future development.*—As the demand for quinine is not a growing one and is a fluctuating one, no future programme exist now. Actually, even the existing factories are not working to their full capacity. In the circumstances, it is not likely that the industry will expand in the near future.

C. PENCIL INDUSTRY.

1. *Number of factories.*—There was only one pencil factory in the State, viz., the Madras Pencil Factory, Washermenpet, Madras.

Total installed capacity—About 1,500 gross per day of 8 hours.

2. *Number of employees.*—25.

3. *Prevailing capacity.*—1000 gross per day.

4. *Source of energy,*—Electricity.

5. *Equipment.*—Pencil making lathe machinery.

6. *Skilled workers,*—25 per cent.

7. *Degree of mechanization.*—Only partly, packing, lebelling and despatch by manual labour. There are no facilities for training the labour.

8. *Raw material*—It is generally imported from Australia, America and Germany.

9. *Ownership*—It is privately owned factory.

10. *Marketing.*—The manufactured pencils are supplied to all pieces in India.

11. *Species used.*—The following are imported species used in the manufacture.

Common Name.	*Latin name.*
(1)	(2)
African ceder	Juniperus procera.
American cedar.	Juniperus Virginiana.
Australian cedar.	Juniperus species.

The local indigenous wood is rarely used as suitable species are not available in large quantities on a sustained supply basis.

12. *Details of production.*—During the period 1953-55, about 1½ lakhs gross pencil slots were imported annualy for making pencils. This amounts to about 28·3 cubic metres (10,000 cft.) of round logs.

13. *Future expansion activities.*—Due to restrictions in import, much difficulty is experienced in importing the required raw materials. As there is no local supply of raw material, the future expansion programmes solely depend on the imported raw materials which is controlled by the import policy of the Government of India. Adequate capital for investment is readily available.

D. Wood treatment plant.

1. (a) *Number of units.*—One factory maintained by the Madras Electricity Department existed at Coimbatore during the period 1953–55.

(b) *Number employees engaged in industry*—30 persons per working day.

2. General description of the plants from the technical point of view.

(a) *prevailing capacity.*—4,700 electric transmission poles were treated every year.

(b) *Transportable unit.*—The factory is a fixed one.

(c) *Source of energy*—Steam generated by firewood.

(d) *Debails of equipment.*—The main equipments used were vertical Cochrane boiler and two rectangular treatment tanks containing a series of steam coils.

(e) *Degree of mechanisation.*—All the operations were done using manual labour only.

(f) *Percentage of skilled workers.*—17 per cent.

(g) *Training possibilities.*—As the plant is a small one and only a simple process was used, there were no facilities for training.

(h) *Integration with other plants.*—This treating unit functioned alone without being connected with any other unit.

3. General description of the plants from the economic point of view.

(*a*) *Distribution of mills in the country.*—There is only one plant at Coimbatore. Due to paucity of poles for treatment more plants could not be established. Since most of the electric transmission poles come from the West Coast Forests, Coimbatore was decided which is nearer to the forests of west coast.

(*b*) *Salient features of ownership.*—This plant is owned by the Madras Electricity Department.

(*c*) *Marketing.*—As the treated poles were used by the electricity Department itself, marketing of the poles does not present any difficulty.

(*d*) *Government support.*—Since the plant was owned by one of the Government Departments, all possible help was given to the plant. By agreement with the Forest Departments, poles for treatment were supplied to the plant.

4. *Details of process, etc.*—The chemical used for treatment of the poles consisted of ceosote and furnace oil mixed in equal proportion. When the poles are immersed in this mixture, the mixture of oils was heated up to 175 °F and allowed to cool.

5. *Main species used.*—*Tectona Grandis* and *Xylia xylocarpa* poles were used for treatment.

6. *Raw material supply.*—There is dearth of raw meterial, i.e., poles for treatment and as a result, the plant is not functioning through out the year. In addition to that supplied by the Forest Department, tenders for supply of electric transmission poles are called for from the open market as well. Still, the supply is not adequate. As large number of poles answering the specification of the electricity Department are not readily available in the forests of this State or outside, this dearth for raw material is likely to continue for some more years to come.

7. *Future development.*—Efforts are being made to use new species palmyrah as electric transmission poles after treatment. If these attempts succeed, then there is scope for expanding the activities of this industry. In 1957, another treating plant was established at Mettur and the plant treated about 2,500 poles in 1957. There are also plants to set up two more pressure treating plants at Coimbatore to treat about 10,000 poles a year. All these will mainly depend on the availablity of poles for treatment. With the limited forest resources of the State, the future does not appear to be very rosy unless the Irrigated Teak Plantations proposed to be raised under the Second Five-Year Plan succeed.

APPENDIX I.

FOREST INDUSTRY.

1. Indicate the number of distillation units, their total installed capcity, number of employees engaged in the Industry.

2. General description of the plants from the technical point of view: Prevailing capacity; transportable unit, source of energy (use of waste products), details of equipment, degree of mechanisation, percentage of skilled workers, training possiblities, integration with other plants, the particular part or class of material that give a higher extraction percentage.

3. General description of the plants from the economic point of view; Distribution of mills in the country, their concentration according to nearby consumption centres, to raw material resources, to export facilities, the salient features of ownership, information on the marketing of the produce, details regarding the small scale industries, if any, influence of foreign capital on existing plants, direct or indirect support of the industry by the Government, i.e., reduced taxes, less export duties for the oil, low import duties for the machinery and spare parts, loans at low interest, financial help for exports quantitative restriction on imports, Governmental planning of production, etc.

4. Give the chemical constitution of the end products produced, the steps taken to standardise the quality of the end product obtained.

5. State the main species in use (giving botanical names in latin).

6. Estimate the average quantity of end product obtained by processing of 45·359 kilograms (100 lb.) of wood, leaves or bark, indicate separately the figures for cottage industry and the mechanised industry.

7. Estimate roughly the wastage produced, give percentage of uses made of this waste in various ways.

8. Indicate (*a*) if raw material supply in recent years has been ample or if these were difficulties as regards the current supply of raw material.

(*b*) the procedure for procurement of raw material (e.g. own concession, state obligation to deliver the raw material, purchase of raw material on the open market). Estimate percentage of each procedure weighted by quantities.

(*c*) The resources of raw material supply, how they are obtained, the details of availability, etc.

9. Indicate such future expansion of development as is already planned.

10. Furnish the quantity of the ex-products contained in the following form :— Unit

Name of commodity.	*Unit in* 100,	1935–1938 *average.*	1947.	1948.	1949.	1950.	1951.	1952.	1953.	1954.	1955.	1953–1955 *average.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(*a*) Produced in the factory.												
(*b*) Indigenous production in cottage industry.												

SECTION E:

External Trade.

1. The details of recorded imports and exports are furnished in tables 5(*a*) and 6(*a*), as far as they pertain to the present Madras State, which includes the ports of Madras, Cuddalore, Nagappattinam, Tuticorin and Dhanuskodi. The item of produce that have not been imported into or exported from this state are shown as " Nil ".

(*a*) *Imports—Table* 5(*a*)—No plywood and only negligible quantities of firewood, sleepers and coniferous sawnwood have been imported during the period 1947 to 1955 as against the 1935/38 average. This is mainly due to increased indigenous production of these commodities and due to the impetus given for increased production during the war years.

The fall in the imports of teak sawnwood after 1947 is probably due to increased production from the Andamans and increased use of secondary species due to abnormally high ruling prices for the indigenous and imported teak.

The imports of pulp and paper products have more or less remained steady in spite of increased production in the country, probably due to increased consumption. The import of chip boards has steadily increased due to increased consumption.

(*b*) *Exports—Table* 6(*a*) The exports from this State are not appreciable. The exports of teak and coniferous sawnwood and plywood have been occasional to meet specific demands from the neighbouring Eastern countries.

The export of pulp and other paper making materials have steadily increased and these exports are generally made to the neighbouring Eastern countries against specific demands. The export of other varieties of manufactured paper and chipboard have been occasional or small to meet the sudden demands that arose.

2. Details regarding unrecorded imports and exports are not available and hence, these may be considered as "Nil". So *tables* 5 (b) and 6 (b) are "Nil" with regard to this State.

3. There are no imports or exports of bamboos and palm species into this State.

4. The export policy of the Government of India was based more on quota system than on levy of duties so that the exports were limited only to that available as surplus in the country after local consumption. The export policy also took into consideration the traditional supplies from the country to others as of 'export size rosewood, white cedar and others ', to Italy, France and other European countries, and export of "Red wood" to Japan and China and minor forest products to other countries.

Imports were limited to sawn timber and semi-finished products for special purposes pencil, slates, pulp, textile accessories and others. All these imported wood articles were subjected to varying extends of import duties in the form of protective duties in most cases and as revenue, in others. Exemptions from such duties are granted, mainly on reciprocal basis for imports from certain countries as Burma, by mutual agreement.

5. Since export of wood articles do not bring in large revenue to the State, the consideration of the factors that adversely affect exports do not arise. As the timber production in the State is by far short of the local demand itself, exports are not sizable. This again is the main reason for considerable imports of wood products from abroad. The case of Burma teak is an example. Our efforts to reduce imports and to augment the internal supplies besides organising manufacture of the goods internally have also borne fruit. Wood requirements of the match industry and plywood for tea chests are cases in point.

Since we do not have any large unexploited timber resources in the State, and as we have mainly to depend for our future development on what we are trying to grow now, the future trends of the imports and exports of the wood products in this state are not easy to forecast. We have an elaborate programme of afforestation and reafforestation to execute and it will enable us to increase the exports and reduce the imports of wood products in the near future.

SECTION F:

Part I.

PRESENT CONSUMPTION OF FOREST PRODUCTS—END-USES:

General.—The data for the Tables 7 to 12 were collected by sampling. The method of sampling adopted was decided after taking into consideration, the details of the limited personnel available and the time at their disposals for devoting to the work on hand. In this method of sampling adopted, each district in the State was considered as a unit of data collection. To arrive at the end-use pattern of the various timber produce except firewood in each unit it was

considered adequate to collect the end-use data in an important taluk-quarters of the district and multiply it by the number of taluks in the district. In case of firewood, the initial data was collected in the same way as above but the factor for multiplication was arrived as by taking population into consideration. In the paragraphs that follow, the methods adopted have been described fully and the accuracy of the data collected has also been discussed fully.

Timber produce other than firewood.—Timber in its various forms, and bamboos are generally purchased by the public, from the regular dealers in towns. Generally the people who live in and round towns consume more such purchased timber produce, than those who live in the rural areas. These timber dealers exist only in important towns of the districts as taluk headquarters. In the districts, there are only few towns besides taluk headquarters where such timber dealers exist and all taluk head quarters are not of the same importance. In order to cover the timber dealers in towns other than taluq headquarters, it was considered sufficient that if the data is collected from an important taluk headquarters and multiplied by the number of taluks in the district. Such a method will give figures which will be higher than what is actually consumed in the district. It is presumed that the difference between the quantity actually consumed and that which has been calculated will be equal to the quantity of timber and other produce sold by the merchants in towns other than taluk headquarters. In all probability, the figures arrived at by this method may not be very much higher than what is actually consumed in the district, for the timber dealers in smaller towns are likely to be retain dealers who purchased their wares from the bigger merchants from the nearby big towns,

In the actual collection of data at the taluk headquarters, small retail dealers were few and were excluded in order to avoid duplication of the data collected. The various sale records maintained by the merchants during the period 1953 to 1955 were analysed and the details under each end-use pattern were assigned.

The final figure for the whole State was arrived at by adding the figures for all districts.

Firewood.—The case of firewood had to be viewed from an entirely different angle because unlike other timber produce, firewood is consumed by one and all daily in some from or another. So in this case, it was considered necessary to base the calculations on the population of the district. The total quantity of firewood consumed at an important taluk headquarters was collected from the firewood dealers. This figure was multiplied by the proportion which the population of the taluk headquarters bore to the population of the district, to arrive at the quantity which is consumed by the people in the district. The quantity for the whole State is calculated by adding the figures for all the districts.

It is apparent that at the important taluk headquarters of the districts, there are likely to be industries which consume considerable quantities of firewood and such industrials may not exist in all the taluk headquarters in an equal proportion. As the data have been collected in important taluk headquarters, it would appear that the final figure for the district may be higher than what is actually consumed by the people. But in the villages also there are several cottage industries which consume considerable quantities of firewood as the brick kilns. Further, the present tendency in the towns is to use less and less firewood and to go in for other kinds of fuel, unlike the villages which mainly depend on firewood. As Madras State is mainly an agricultural State and 70 per cent of the population live in villages ; it is expected that the above estimation for firewood for the State is likely to be a fairly accurate one.

The individual details with regard to each table are furnished below:—

(i) *Table* 7—(Present consumption of unprocessed round wood).—The date for filling up this table were calculted by the method detailed under the head "Timber produce other than firewood". Since no "pit props" are produced in this State, the details under that column are nil. As wood is not

used in this State for "mining" purposes and as "hewn sleepers" the details against these two heads are "nil". Because sandalwood is also used in the form of round wood, it has been included under the head " others". Under the head "Others–Miscellaneous" are included the use of wood as cots, furniture, etc.

(ii) *Table* 8—(Present consumption of sawnwood).—The details for filling up this table were collected as in the case of *Table* 7. No sawn timber has been used for "mining" and "Match industry". Under the head "Other end-uses" are included sawn timber used as agricultural implements, parquets, etc., It will be seen from the datails furnished below the table that considerable quantity of teak and broad leaved sawnwood are imported from the neighbouring States like Kerala to meet the local demands in the State.

(iii) *Table* 9—(Present consumption of veneers and plywood).—Veneer is consumed in this State only after conversion into splints for matches. Little is consumed as vecer itself in other end-uses.

There is no plywood factory in this State. The entire quantity used is imported from the neighbouring States as Kerala. The end-use data for plywood have been collected in the same manner as for *Table* 7 plywood does not appear to be used in match manufacture and ship-building.

Table 10-(*a*)—(Present consumption of bamboo).—The details for filling up this table were calculated in the same way as for *Table* 7. There is no import or export of bamboo.

Table 10-(*b*)—(Present consumption of palms).—The data for filling up this table have been calculated in the same way as for *Table* 7. There are neither imports nor exports of palm species in this State.

Table 11—(Present consumption of firewood).—The details of this table have been filled up as given under the head " Firewood " in this Section. From the details given under "Supply" it can be seen that recorded production forms only about 2 per cent of the total quantity actually consumed. Nearly two-thirds of the firewood comes from the areas outside the reserved forests and about one-fourth of the firewood is imported into this State from outside.

Table 12—(Present consumption of charcoal).—The details for this table were collected as for *Table* 7. From the details given under the head "Supply", it can be seen that the recorded production forms only a negligible quantity. Nearly 70 per cent of charcoal comes from unreserved sources, viz., areas outside the forests as private topes, patta lands, etc. More than one-fourth of the produce is imported from the neighbouring States.

Part II.

Some indicators of fast trends.

In relatively backward countries like India, there are considerable difficulties in getting the necessary details regarding factual information of the past as there was no systematic collection of statistics regarding the country, its people and their activities. Further, the important and many political changes that have taken place in India during the period under consideration, viz., 1935 to 1955, as the declaration of independence, the partition of the country and the re-organisation of the various States in India in 2 or 3 stages have rendered the position more difficult. For drawing conclusions from the statistical data maintained for years of a country, certain factor like the geographical limits of the country and the mode of collection of data have to remain uniformly constant. In case of Madras State, its geographical limits have changed thrice

after 1947 and in its present condition, it come into existence only towards the end of 1956. Thus, the conclusions drawn from the statistical information collected in the past may not portray the true situation. But it will give an idea of the trend of the things to come.

We are now in the midst of the Second Five-year Plan. During the First Five-Year Plan emphasis was laid on agricultural production and during the Second Five-Year Plan, the emphasis was first shifted to the industrial development of the country, but laterly agriculture also is being emphasized. But the Five-Year Plans have resulted in considerable progress in the various activities of the Nation and as a result of this, there is increase in the consumption of the various consumer and capital, goods. There is no phase of activity of the nation, in which considerable progress has not been achieved. The Second Five-Year Plan will be succeeded by Third, Fourth, Fifth and further Five-Year Plans of development. If the progress in the activities of the National is maintained as planned, the national income is expected to be doubled in 1957–74. All these mean considerable phased programme of expansion of the activities of the people.

The details of the various forest products consumed by the people during the periods 1935–38, 1948–50 and 1953–55 are furnished in the table given below :—

Name of commodity.	Per capita consumption during. 1935–38 Period.	1948–50 Period.	1953–55 Period.	Remarks.
(1)	(2)	(3)	(4)	(5)
Newsprint.	3,629 Kilogram. (0.8351 lbs.)	5,447 Kilogram. (1.180 lbs.)	697·626 Kilograms. (1,538 lbs.)	
Plywood.	Do.	Do.	007918 Sq. metres.	(0.08798 sq. ft.)
Timber in round.	Do.	Do.	000617506 Cubic metres.	(0.02182 cft.)
Teak sawnwood.	Do.	Do.	000393087 Do.	(0.01389 cft.)
Other sawnwood	Do.	Do.	000901185 Do.	(0.03195 cft.)
Firewood.	Do.	Do.	28583 Do.	(10.1 cft).
Bam oos.	Do.	Do.	3.052 Kilograms.	(6.726 lbs.)
Palms.	Do.	Do.	1.048 Do.	(2.091 lbs.)
Charcoal.	Do.	Do.	3179 Do.	(0.7003 lbs.)

The consumption data for the periods 1935–38, 1948–50 and 1953–55 were calculated in case of "Newsprint" only. The consumption data for "Firewood", "Timber", "Charcoal", 'Plywood", "Bamboos" and "Palms" were not available for the periods 1935–38, and 1948–50, and were available for the 1953–55 periods only. In case of these products, as "recorded production", is only a fraction of the total quantity consumed and no data regarding the quantity consumed other than recorded production is available, it is not possible to assess the consumption per head during the periods 1935–38 and 1948–50 with any degree of securacy. With regard to the consumption data of other products it is not possible to calculate with any accuracy due to political charges, non-availability of internal production and actual consumption figures and other reasons.

The consumption per head for " newsprint " was calculated from the import data after deducting the exported quantities. This calculation is based on the consumption that all the quantities imported are consumed within this State itself. It is seen that due to increased developmental activities and non-production of newsprint locally in this State, there is steady increase in consumption.

In case of her forest products, the trends cannot be analysed for want of data for the periods 1935-38 and 1948-50.

Since the forest resources of this State are limited, people are using more and more indigenous and locally available valuable timber. The high price for teak and its non-availability in numbers in the market, are forcing people to use other important junglewoods in place of teak. People have not yet adopted preservative treatment for semi-durable species. The increased demand for more timber and the limited timber resources of the State are likely to induce people to take to preservative treatments. The use of preservative treatment for the low-grade sleepers of the Railways is a case in point. The setting up of the preservative treatment plant by the Railway at Olavakkode is likely to induce people to take to preservative treatment.

SECTION G.

Appraisal of future requirements of roundwood and its product by end uses.

General.—India is well set on the road of planned economy and it is half-way through the Second Five-Year Plan. Since the National Planning Commission and the National Development Council have laid out the future developmental programmes for the country for the next few decades, there is no difficulty in the calculation of the future requirements of the timber resources. The books referred to in this connection have been listed out at the end of this section.

Calculation of the Maximum and minimum percentage of increment in National income for 1960, 1970 and 1975.—During the First Five-Year Plan, an increase of 2·2 per cent per annum in per capita national income has been achieved. The National Planning Commission proposes to step up this increase in per capita national income by adequately planning the nation's future developmental activities and has propose to double the per capita national income by 1973-74. The highest increase in per capita national income proposed at this rate of development is 4·0 per cent per annum. Even if there is difficulty in achieving the rate of increase of 4·0 per cent per annum, at least the rate of increase of 2·2 per cent which was obtained during the First Five-Year Plan is expecded to be maintained. So, the minimum and maximum rates of increase in per capital national income has been taken as 2·2 per cent and 4·0 per cent per annum respectively.

The maximum and minimum rates of increase is in the per capita national income arrived at in the last paragraph are based on All India data, adopting it for Madras State, it has been assumed that the developmental activities of the whole of India will be reflected in a proportionate manner in the Madras State also.

The population of the Madras State has been increasing at the rate of 1·38 per cent per annum during this decade 1951-60. The All India figure is 1·25 per cent based on the population increment figures for the last few decades, the projected increase in population for the next two decades for Madras State comes to be 1·47 per cent and 1·55 per cent per annum. In this calculation, it has been assumed that the trend of increase in population during the past will be maintained in the next two decades also. The increase in the standard of living in the population due to developmental activities and the various measures taken to implement the Family planning methods may cause a reduction in the actual increase in population. But, it is expected that these efforts may not produce any appreciable decrease in population and that the present rate of increase at least will be obtained. So, the adoption of the present rate of increase for this decade and the projected rate of increase for the decade 1971-80 as the minimum and maximum rates of increase in population for this state respectively will provide us the two outer limits of increase of population in this State.

The details of the various incremental figures calculated above are given below:—

	Minimum.	Maximum.
Per capita national income	2·2 per cent	4·0 per cent.
Population	1·38 ,,	1·55 ,,

Taking into consideration the above figures, the percentage of increase in national income up to 1960, 1970 and 1975, with the national income of 1953/55 as base, come to be—

Year.	*Minimum.*	*Maximum.*
1960	23·5 per cent	38·6 per cent.
1970	75·7 ,,	13·58 ,,
1975	109·5 ,,	213·0 ,,

The maximum and minimum increment figures for 1960, 1970 and 1975 given above, though based on correct estimates, appear to be more theoretical than practical in view of the complex nature of the developmental pattern of a nation. Several interacting factors come into play during the labours of the nation's developmental activities. Moreover India is the first non-communist nation to phase its developmental activities under definite Fve Year-Plan periods. Being young State, founded on a socialistic pattern, it cannot forcibly muster and mobilise all its resources to achieve its fixed targets. While the material resources on any nation may be gauged fairly correctly, the sacrifices that the people are prepared to make for developing their own country is often unpredictable. So, based on recent experience the following figures for the maximum and minimum increment for the years 1960, 1970 and 1975 are proposed to be adopted in estimating the future requirements :—

Year.	*Minimum.*	*Maximum.*
1960	10 per cent.	25 per cent.
1970	20 per cent.	60 per cent.
1975	25 per cent.	75 per cent.

The data given in tables 13 to 26 are based on the above estimates of maximum and minimum.

Price Trends.—The forecast of the future price trends is much complicated due to various operating forces as inflation, the production of consumer and capital goods the increase in population, the demand and supply of goods and the various measures of taxation proposals of the centre and the State. The Planning Commission has drafted the Second Five-Year Plan with a definite bias towards capital goods than on consumer goods. In the subsequent Five-Year Plans, this bias is likely to decrease and a rational relationship established between them. The sudden increase in prices during the Second Five-Year Plan is due to this bias in development of capital goods as heavy industries. The Goverment are trying to maintain the price level by pegging down the prices of good stuff by various methods such as opening fair price shops. In India, 60 per cent of the per capita national income is spent on food stuff and so any rise in the food price level affects price or other goods also. The price of timber products fluctuate according to those of food stuffs.

The price level during the period 1953–55 was one of the lowest in the recent years and the current price level is about 15 per cent higher than that of 1953–55. With less bias towards capital goods industries during the Third and subsequent Five-Year Plans, it is expected that the price level will go down to that of 1953–55. The price structure of a country is not only complicated but also attains a

fluid state, when the Government itself tries to control it by various corrective measures. Thus, it is not possible to forecast with any accuracy, the small fluctuations which may occur in the price structure of the future.

Statistical data.—The explanatory details regarding the data collected for filling up *Table* 13 to 25 of this section are given in the paragraphs that follow :—

Table 13.—The methods adopted for the maximum and minimum estimates of the per capita national income and the population of the Madras State for 1960, 1970 and 1975 have already been described in the previous paragraphs of this section.

Similar estimates for the " National income ", " Agricultural output " and " Industrial output " have been made based on the All India Data, as no separate data for Madras State exist.

In case of National Income, the rise during the First Five-Year Plan has been assumed as the minimum estimate and the highest rise forecast for the subsequent Five-Year Plans at the maximum estimate, as the developmental activities are proposed to be increased during the Second and subsequent Five-Year Plans.

For " Agricultural " output the increase during the First Five-Year Plan has been assumed as the maximum estimate, since the First Five-Year Plan was really an Agricul ural Plan which paved way far greater agricultural production. The minimum estimate has been fixed to the same minimum annual rate of increase of national income, viz., 2·2 per cent as the details of " Agricultural output " for the other Five-Year Plans are not readily available for comparison.

In the case of " Industrial output " the maximum estimate has been calculated from the prod ction figures of Second Five-Year Plan which is really an Industrial Plan. The minimum estimate is based on the production figures for the first Five-Year Plan, which achieved only a modest increase in industrial output.

Constru tion (*Table* 14) :—In assessing the requirements of " Sawnwood " under " housing", the programmes of expansion of the activities of the various House Construction Societies and the City Improvement Trusts have also been taken into account. Since " Veneers " are not used now for construction purposes, the forests made for the future are only rough estimate.

Mining (*Table* 15).—Very little of mining was done in the State during 1953-55. The Neyveli Lignite Project and other mining projects are likely to come in to operation during the period up to 1975. The future requirements given are rough estimates only. " Veneer " is not used for packing in any quantity now. With the increased industrial development, it is likely to be used more and more, and a rough forecast for the future has been attempted.

Transport and communications (*Table* 16).—Very little " other industrial wood " is used for sleepers in the State, as hewn sleepers are almost unknown in this State. This is likely to be the position up to 1960 also. Since it is likely that the position may charge beyond 1960, rough estimates for the future years have also been made.

As in any other end-use, " Veneers " are little used in the " Vehicles " and " Ship-building " sectors. Since this position is likely to change in the future rough forecasts for the future have been made.

The " ship building " industry uses very little of plywood in this State. When the industry expands and begins to build larger boats, the consumption of plywood is likely to increase. Rough estimates have been made for the future

Wood working industries (*Table* 18).—The case of "Veneers" is the same as that for the previous tables.

The rough percentages for the various industries are :—

(i) Sawnwood	.. .. ..	Carving	25 per cent.
		Others.	75 per cent.
(ii) Plywood	.. .. ..	Toy industry	10 per cent.
		Cinema.	20 per cent.
		Others.	70 per cent.
(iii) Bamboos	.. .. ..	Carving	5 per cent.
		Others.	95 per cent.

Fibre board, chip board, paper board (*Table* 19).—There is no indigenous production of fibre board and chip board in this State. The entire quantity consumed is imported from abroad.

The quantity of "paper and board" consumed in this State is made up of quantities indigenously produced plus imports minus exports.

Fuel wood and charcoal Table 20.—An important factor that will affect the future consumption pattern of fuel,wood and charcoal is the use of lignite as fuel. With the marketing of lignite briquetters as fuel by the Neyvali Lignite Corporation, the use of firewood is expected to be reduced to some extent. Since it may take some years before the lignite is marketed, it is expected that the firewood and charcoal pattern of consumption up to 1960 may not change. It is expected that the use of lignite may not reduce more than 10 per cent and 15 per cent respectively under maximum and minimum estimates for the period 1970 and 1975 in case of the firewood and charcoal.

Little charcoal was used by the Railways during the period 1953/55 and the position is likely to remain so in the future also.

Summary (*Tables* 21 *to* 23).—The data for table 21 have been collected and filled up. Tables 22 and 23 have been filled only partly as the conversion factors for the imported paper and fibre board are not available. The merchants who import these articles are not in the know of the processes employed in their manufacture. Since there are no paper mills in this State, it is not possible to ascertain these details.

Exports (*Tables* 24 *and* 25).—The small extent and the poor type of forests in the State do not indicate a bright prospect for the exports of the main timber produce. What is locally reduced is not even adequate to meet the local demand. So it is unlikely that the exports of timber produce will increase; on the other hand, there is every likelihood of it diminishing. The imports still figure high in the economy of the State.

In Table 24, no accurate forecasts for maximum and minimum estimates for 1960, 1970 and 1975 have been given as there is no indigenous production of "plywood", "Newsprint", "Other paper" "Paper board" and "Fibre board". The export of these items will depend mainly on demand outside and the quantities imported into this State. It is not possible to forecast this with any degree of accuracy. Since there is short supply of sawn wood, the export pattern will again depend on the demand outside and the quantity imported into this State. It is expected that the quantities exported during the period 1953/55 may not be exceeded and this has been furnished as the maximum for the years 1960, 1970 and 1975 for all items. As there is short supply of these items, it is likely the export of these items may stop completely. So the maximum estimates have been kept as "nil" (for 1960, 1970 and 1975 for all items). There is no export of the following items "Pit props", "Other Industrial wood", "Bambo" "Palm Trees" Fuelwood and charcoal. The principal markets of export are not likely to change.

In table 25, the details for paper and fibre board have not been filled up for want of data. In this State, no exports of the following items are made. "Pit props', " Other Industrial Wood " " Fuelwood", "Charcoal ", Bamboo for pulping , Bamboo for other purposes, " Palm trees ", "Reeds for pulping" rice straw for pulping , bagasse for pulping and other raw materials for pulping.

LIST OF BOOKS REFERRED TO IN COMPILING " SECTION G ".

1. Review of the First Five-Year Plan.

2. Second Five-Year Plan.

3. Second Plan Madras State.

4. India,1956.

5. India, 1957.

SECTION H.

Future supply of Raw Materials from Indigenous Sources : The estimates furnished in this Section and table 26, are only approximate as it is not possible to state definitely how far and to what extent the developmental activities will affect the outturn from the forests. The details of assessment made with regard to various items are furnished below—

I. *Roundwood*—(*a*) *Existing forests in use.*—Up to 1960, there is no likelihood of any increase in the outturn from the forests. The management of the ex-panchayats and ex-zamin forests taken over by Government recently, and the fuller use of the species hitherto not marked may result in increased production of timber and fire wood during the periods ending by 1970 and 1975. As most of the ex-panchayat and ex-zamin forests are mainly of firewood type, the increase in firewood is likely to be more than that of timber. This increase has been estimated for timber as 10 per cent and 20 per cent respectively for normal and maximum estimate and for firewood, as 20 per cent and 40 per cent respectively for normal and maximum estimates, for the period ending 1970 and 1975.

(*b*) *Accessible forests not yet utilised* :—There is only very little area under this type, as the accessible forests remain unused mostly due to their unsuitability only. So, any increased production of timber and firewood cannot be expected from these sources in the near future.

(*c*) *Inaccessible forests.*—The inaccessible forests can be exploited by laying out new roads and opening up interior tracts. Since this will apply equally for firewood and timber, an increase of about 10 per cent and 20 per cent respectively for the normal and maximum estimates for each of the periods ending 1970 and 1975 are expected. An increase of 2 per cent and 5 per cent respectively for the normal and maximum estimates is expected to take place during the period ending 1960.

(*d*) *Afforestation* :—It takes a number of years before the afforestation works become ripe for harvest. Further, the timber plantation take more time to grow than the firewood plantations. So, it is expected that up to 1960, the effects of afforestation in increasing the yield may not be felt. During the periods ending 1970 and 1975, it is expected that the firewood out-turn may increase for each period by 10 per cent and 20 per cent respectively under " normal" and minimum estimates. No increase in yield in timber is expected during the entire period ending 1975.

(e) *Trees from outside the forests* :—There is no concerted effort in planting areas outside the forests besides Vanamahotsava which was started early in the beginning of this decade. In Vanamahotsava also, there is emphasis on fruit and timber yielding trees only and not much on quick growing timber or fuel species. Further, as these trees are in the open and are not locked after or tended properly, their growth is not likely to be normal. So, no increase in yield is expected under this head for the entire period ending 1975. The existing yield is expected to remain steady.

(f) *Improved logging operation.*—As there is no large scope for introducing improved logging operations in this State, such improvements as may be introduced may not result in any appreciable increase in the out-turn.

(g) *Industrial wood–waste.*—At present there are no units making use of the wood waste available in the wood based industries. There are proposals to set up-chip board and fibre board factories in this State shortly. This will result in increase d utilisation of timber trees only and will not affect the firewood yield. So, for the periods ending 1970 and 1975, an increase for each period by $2\frac{1}{2}$ per cent 5 per cent respectively for the normal and maximum estimates in case of timber species from forests are expected. For the period ending 1960 no utilisation of this industrial wood-waste is expected. The quantity used for making chip-board etc., is not expected to exceed 50 per cent of the total waste even under maximum estimate for 1975.

For the minimum estimates for the various years, certain orbitrary quantities have been fixed.

II. Bamboos (*a*) *Existing forests in use.*—The proposals is to set up bamboo and rayon pulp factories is likely to result in intensive exploitation of the bamboo forests. The butt ends which are left in the clumps in the interior of the forests are likely to be exploited also. Hence, it is excepted that for the periods ending 1970 and 1975, an increase for each period by 10 per cent and 20 per cent respectively for the normal and maximum extimates are expected. No increase up to 1960 is anticipated, as the factories will not be established by them. Separate figures for the quantity used as firewood are not available.

(*b*) *From new areas* —The opening of new roads will open up fresh areas for exploitation. It is expected that for the periods ending 1970 and 1975, an increase for each period by 10 per cent and 20 per cent respectivily for the normal and maximum estimates may be obtained An increase of 2 per cent and 5 per cent respectivily for the normal and maximum estimates are expected to take place during the period ending 1960. Separate figures for the quantity used as firewood are not available.

III. Palm Trees.—There is no likelihood of any increase in the out-turn of palm trees, as no increased activities in the propagation of palm trees is expected to be done.

SECTION I – CONCLUSIONS.

General.—Madras State possesses only 17·5 per cent of total geographical land area under its forests, against the 22 per cent for the whole of India and the optimum desired limit of 33–1/3 per cent. As more than three fourths of the State gets rainfall less than 762 metres (30 inches) per annum, the conditions for growing good timber forests quickly do not exist. On the other hand, it is one of the thickly populated States in India with a population of 664 persons per sq. kilometre (sq. mile) of land area, and the impact of this big population on the more or less limited forest resources of this State is felt squarely a d acutely on all sides. As a result, the picture that is pointed in this survey about the present status and the future is not sanguine but one that calls for dynamic action on all fronts and detailed and intensive planning.

Comparison of tables 22 *and* 26.—On the fact of it, the quantities furnished in table 26 are far short of those in table 22 i.e. the estimated raw material supply is far shorter than those of the total internal requirements This but natural, in view of the meagre extent of the forests in this State. Each item is discussed separately below.—

(*a*) *Roundwood.*—The total internal requirements of rounds appear to be more than double the estimated raw material supply in 1953/55. The difference in quantities are not partly by roundwood produced in areas outside the forests and by imports from the neighbouring States and abroad.

The position appears to worsen when we consider the 33 years 1960, 1970, and 1975. The gap between the total internal production and the maximum and the minimum estimates of consumption of round wood windens from 1960 to 1975. While these figures may apear to be stagering, they depict the seriousness of the real situation and our dependance on outside resources to meet our requirements.

(*b*) *Fuelwood.*—The total internal requirements are more than that of estimated raw meterial supply on 1953/55. The position deteriorates further for the periods ending 1960, 1970 and 1975. As in the case of round wood, considerable quantities are obtained from areas outside the forests and by imports from neighbouring States and abroad.

No comparison of paper, bamboos and palms can be made as they do not occur in both the tables.

By continuing the tempo of the existing schemes of afforestation and expansion, the estimates forecast in table 26 should be achieved. All these schemes have been included in the Second Five-Year Plan and have progressed considerably. The same rate of expansion and development have been assumed for the " normal " estimate while the " maximum " estimate has been fixed arbitrarilly as double that of " normal ".

The gap that exists between the estimates on tables 22 and 26 is a formidable one and appears to be unsurmountable. The details as to how this has come about and how this could be patched up have been discussed fully in the paragraphs that follow :—

At this juncture, certain facts regarding the building up of data for the tables 22 and 26 require some comment. In constructing table 22, a high rate of minimum and maximum increase in national income and population has been assumed. With proper planning and development, this rate of progress is not impossible to achieve. The details for filling up table 26 could not be ascertained with the same degree of certainty as those for table 22. Further, the rate of development of trees is a steady one and for our purposes it appears to be comparatively more static than dynamic. It cannot be made to increase its vegetative activity beyond a certain limit to any desired extent. Further, the area of a country is also a constant and with increased population and increase developmental activities, not only the area under the forests but also that available for afforestation diminishes. This is a historical fact to reckon with. In reality, it may turn out that our estimates of internal round wood in table 22 and over estimate and those of roundwood in table 26, under estimated. But, the disparity existing in the 1953/55 period is not going to be diminished or maintained ; the hiatus if at all, certainly will be glaringly on the increase. Thus the question of closing this gap marits more attention.

Closing the gap.—The question of finding out ways and means to close the gap that exists between this supply and demand with reference to roundwood, fuelwood and other forest products does not appear to be an easy one. It has to be tackled from all angles at all levels. An assessment of what can be done taking into consideration the resources and the facilities available with us, is attempted in the paragraphs that follow

The low rainfall and the comparatively poor quality of the forest soil in the State make it a difficult proposition to grow timber forests quickly. The conditions are less advantageous here than in the west-coast or other heavy rainfall areas. The number of timber species that can grow in these low rainfall arid conditions are not many. Further, the more or less plain terrain of this State has been responsible for more areas being under cultivation with less areas under the forests. For the very same reason, any patch of land with good soil is under an agricultural crop and only bouldery and poorer soils have been set aside for raising forest growth. There is always clamour for dis-reservation of more forest areas for one reason or other as agriculture, industrial, animal farms, etc. These are the problems that have to be faced in this State if any quick afforestation is to be attempted.

To increase the area under the forests in this State, the following programmes of afforestation are suggested on a ten year scheme.

(i) Afforestation of degraded areas,

(ii) Afforestation of canal and stream bunds, tank beds, dam sites, avenues, Railway tracks, etc.

(iii) Afforestation of village porombokes and other waste lands, and

(iv) Practice of farm forestry by each and every cultivator,

(i) *Afforestation of degraded areas.*—This work has already been taken up on hand and much progress has been achieved in this direction. The tempo of planting cannot be increased still further as complications in respect of providing grazing for the village cattle will arise.

(ii) *Afforestation of canal bunds, etc.*—This remained an unexplored avenue of afforestation till a few years ago. The work done during the last two years have shown us the potentialities of this activity. The water table is quite high in these zones and the plants grow more or less under simulated irrigated conditions on good loamy soils. The growth is expected to be quick.

In this State, almost all the possible hydro-electric schemes have been completed and much headway has been made in the various minor irrigation works also. So, the potentialities for afforestation in this direction appear to be enormous. The District Forest Officer, Thanjavur Division, is actually conducting a survey of the areas available for this method of afforestation. On completion of this work, a ten-year scheme to cover the entire area may be drawn up for execution. Among the various schemes of afforestation suggested this will be the most fruitful one as important timber species as teak could be grown quickly. Pointed attention is called for this particular aspect of the question as the resources of this state in this regard is particularly lean.

Large stretches of road avenues and the either sides of the Railway tracks could be planted with useful species. This work has not yet been taken up by the Forest Department. There are about 47,503·006 Kilometres (29,517 miles) length of roads and 8,510·212 Kilometres (5,288 miles) length of Railway tracks are available. Assuming that either side or roads and Railways are fit for planting at 10·058 metres (33′) apart the number of trees planted will be equivalent to 41·44 kilometres (16 sq. miles) of plantations at an espacement of 10·058 × 10·058 metres (33′ × 33′).

(iii) *Afforestation of village porombokes and waste lands.*—The general clamour of the agriculturists is for more land and annually new ground is broken up in some form or other. But the actual areas that remain fallow in any village is never brought to prominence and large tracts do lie as village waste lands and porombokes uncared for. The extent of those lands can be assessed from the following figures for Chingleput revenue district.

Total area	7,902·09 kilometres (3,051 sq. miles).
Area of waste lands suitable for cultivation	326·34 sq. kilometres, i.e., 4·1 per cent (126 sq. miles).

Assuming that the waste lands exist in the other districts also in the same proportion, the total area available for afforestation in the whole state will be $\frac{49,962 \times 4 \cdot 1}{100}$ (2,048 sq. miles), 5,304·32 sq. kilometres. The entire area could be covered on a ten-year scheme.

(iv) *Farm Forestry.*—The scope for farm forestry in India appears to be enormous. More than 70 per cent of the population live in villages and per cent pursue some form of agriculture as their occupation. If each one of them is made to realise the potentialities of practicing farm forestry by planting trees along the field bunds, not only could the forest wealth be increased, but also the agricultural production. Since India is mainly an agricultural country the potentialities of this venture appear to be great.

The increased afforestation activities will call for increased staff properly trained in the works to be taken up. If difficulties are met with in affecting such intensive afforestation programmes, the Government may have to seek remedy through proper legislation.

Even these efforts, may not fully close the gap that exists between the raw material supply and the total internal requirements of round wood. It is just likely that we might have touched only the fringe of the problem but more could not be achieved with the limited resources at the disposal of this State.

SECTION J.

Miscellaneous Problems.

Part I.

Fuel.

Tables 27 and 28 have been filled up and are enclosed herewith.

Part II.

Price series.

The price series per ·00283 cubic metre (per cft.) for the most important species are given below.—

1. *Sawn wood.*

Name of species.	*Sawlog at stumpage price.*	*Sawlog franco sawnmill.*	*Sawlog loco sawnmill.*	*Remarks.*
(1)	(2)	(3)	(4)	(5)
	RS. nP.	RS. nP.	RS. nP.	
Teak	1·00 to 10·00	2·00 to 12·00	4·00 to 24·00	..
Terminalia paniculata ..	1·50	2·50	5·00	..
Terminalia tomentoza ..	1·50	2·30	5·00	..
Dalbergia latifolia ..	1·00 to 25·00	2·00 to 28·00	4·00 to 56·00	..

Since the sawnmills are not engaged in converting round logs and selling sawn-sizes and are merely used for conversion of round logs into sawn-sizes, it is difficult to get representative figures.

2. *Plywood.*—Since there are no plywood factories in this State, no figures are furnished.

3. *Paper.*—Since there are no paper factories in this State using bamboo as raw material, no figures are furnished.

ANNEXURE—I.

TABLE 1.

Recorded removals of round wood from Forests.

Country :—Madras State, India.

Category. (1)	Unit in Cubic Metre (1000 cft.) (2)	1935-38 average. (3)	1947-49. (4)	1948-50. (5)	1949-50. (6)	1950-51. (7)	1951-52. (8)	1952-53. (9)	1953-54. (10)	1954-55. (11)	1955-56. (12)
1. Saw and Veneerlogs (a)—											
A. Coniferous	..	..	..	..	..	..	..	..	..		522·6 (22)
B. Broadleaved	..	..	..	..	..	..	..	..	..	..	
Teak	..	2603·6 (92)	4245 (150)	2575·3 (91)	2971·5 (105)	6226·0 (220)	7018·4 (248)	3028·1 (107)	1415·0 (50)	3169·6 (112)	4726·1 (167)
Other species	..	18112·0 (640)	14517·9 (513)	1[illegible]895·3 (491)	11999·2 (424)	12074·6 (462)	7471·2 (264)	6650·5 (235)	6197·7 (219)	7358·0 (260)	10697·4 (378)
2. Pulpwood—											
A. Coniferous .. } B. Broadleaved .. }	..	..	..	..	..	..	..	..	..	..	..
3. Pitprops—											
A. Coniferous .. } B. Broadleaved .. }	..	..	..	..	..	..	..	..	..	..	..
4. Other industrial wood (B)—											
A. Coniferous	..	..	..	..	..	..	..	..	..	..	..
B. Broadleaved sandalwood	..	962·2 (34)	1047·1 (37)	849·0 (30)	990·5 (35)	962·2 (34)	962·2 (34)	1103·7 (39)	1443·3 (54)	2094·2 (64)	2037·6 (72)
(i) Transmission poles	..	..	..	..	339·6 (12)	169·8 (6)	1160·3 (41)	141.5 (5)	622·6 (22)	141·5 (5)	169·8 (6)
(ii) Forest scaffoldings	..	424·5 (15)	424·5 (15)	424·5 (15)	566 (20)	622·6 (22)	650·9 (23)	707·5 (25)	849 (30)	764·1 (27)	820·7 (29)

5. Fuelwood (c) Coniferous	..	..	..	..	..	..	..	..	..	Negligible.
B. Broadleaved	185846·1 (6567)	615525 (21750)	292678·6 (10342)	264944·6 (9362)	261633·5 (9245)	207269·2 (7324)	153357·7 (5419)	132217·6 (4672)	154607·7 (5463)	235597·5 (8325)

(a) Include round wood for matches and for packing material.

(b) Include hewn sleepers.

(c) Include wood for charcoal.

NOTE.—(i) The figures furnished above relate to forest areas which assist in the present Madras State. As the figures furnished in Ref. No. 29276/56. D2, dated 10 June 1957 of the Chief Conservator of Forests, Madras relating to the old Madras State, they may be deleted.

(ii) For purposes, of rounding off, decimals 0·5 and above are taken as 1.

TABLE 2.

INDIGENOUS SUPPLY OF INDUSTRIAL WOOD (AVERAGE) 1953/55 (*a*.)

Country—Madras State, India. Unit—Cubic Metre (1,000 cft.)

Category.	*Quantity.*
1. Saw and Veneer logs —	
(*a*) Recorded production (*b*)	11,904·9 (403)
B. Unrecorded production : .. .. .. From State forests : .. .. From other forests : .. .. From outside the forests (*c*)	26,347·3 (931)
2. Pulpwood.—	
A. Recorded production (*a*) .. .. .. B. Unrecorded production	Nil.
3. Pitprops.—	
A. Recorded production (*e*) .. .. .. B. Unrecorded production	Nil.
4. Other Industrial wood (*f*)—	
A. Recorded production. (i) Sandalwood	1,754·6 (62)
(ii) Transmission poles	311·3 (11)
(iii) Forest scaffolding	820·7 (29)
B. Unrecorded production.—	
(i) Sandalwood (final cleaned)	Nil.
(ii) Transmission poles	481·1 (17)
(iii) Forest and scaffoldings	16,046·1 (567)
Total, Industrial wood ..	57,166·0 (2,020)

(*a*) Excluding bamboo and palm tree species.

(*b*) See item 1 and Table i.

(*c*) in villages, on roads, canals, estates, etc.

(*d*) see item 2 in Table 1.

(*e*) see item 3 in Table 1.

(*f*) see item 4 in Table 1.

NOTE.—(i) Same as in notes (i) and (ii) of Table 1.

(ii) Industrial details of unrecorded production under 1 Saw and veneer logs viz., from State forests, other forests and from outside the forests are not available separately.

(iii) No sample survey was conducted to collect the details of unrecorded production for want of time and peramal. The information has been furnished by the Range Officers of the forest from a knowledge of the conditions obtaining there.

(iv) Item 1 includes 500 units for matchwood also.

TABLE 3.

Recorded production of Forest Productions.

Country :—Madras State, India.

Category. (1)	Unit in Cubic Metre (1,000 cft.) (2)	1935 38. average. (3)	1947–48. (4)	1948–49. (5)	1949–50. (6)	1950–51. (7)	1951–52. (8)	1952–53. (9)	1953–54. (10)	1954–55. (11)	1955–56. (12)
I. Sawn wood (1)—											
1. Coniferous :											
Hand sawn	..	..	..	..	..	..	..	..	..	..	..
Mill sawn	..	..	..	..	..	..	..	..	..	..	367·9 (13)
2. Broadleaved :											
Hand sawn	..	9623 (340)	8716·4 (308)	7301·4 (258)	6197·7 (219)	8093·8 (286)	4150·6 (182)	2745.1 (97)	1698 (60)	2094·2 (74)	4594 (180))
Mill sawn	..	339·6 (12)	566 (20)	566 (20)	1216·9 (43)	1499·3 (53)	2094·2 (74)	2094·2 (74)	2122·5 (75)	2830 (100)	2333·8 (86)
II. Sleepers (2)—											
1. Hand sawn	..	396·2 (14)	113·2 (4)	367·9 (13)	84·9 (3)	56·6 (2)	..	..	..	339·6 (12)	198·1 (7)
2. Mill sawn		..	..	..	..	..	..	..	..	..	..
III. Plywood and Veneers.—											
1. Veneer (not used for plywood) (3). 2. Commercial plywood .. 3. Plywood for chests ..	..	..	..	..	Nil.	..	..	..	..	..	..
IV. Pulp—											
1. Mechanical woodpulp .. 2. All dissolving pulp (4) 3. Other sulphite woodpulp 4. Other sulphate and sodawood-pulp. 5. Semi-chemical woodpulpe 6. Other fibre pulp (Bamboo agricultural residues.	..	..	..	..	Nil.	..	..	..	..	..	..

TABLE 3—*cont.*

RECORDED PRODUCTION OF FOREST PRODUCTIONS—*cont.*

Country – Medras Stete India—*cont.*

Category. (1)	*Unit in Cubic Metre (1000 cft.)* (2)	1935–38 *average.* (3)	1 1 (4)	1948–49. (5)	1949–50. (6)	1950–51. (7)	1951–52. (8)	1952–53. (9)	1953–54. (10)	1954–55. (11)	1955–56. (12)
V. Paper and Board—											
1. Newsprint											
2. Other printing and writing paper.											
3. Wrapping paper	..	..	..	..	..	..	..	..	..	..	..
4. All other paper											
5. Paper board											
VI. Fibre board.—											
1. Insulating Board ..											
3. Har board (including semi-bardboard).	..	..	..	..	..	..	..	..	..	..	..
3. Resin–bounded particle board (chipboard).											
VII. Charcoal	Metric tonnes. (tons)	97·541 (96)	152·407 (150)	137·167 (135)	137·167 (135)	159·152 (157)	164·600 (162)	50·802 (50)	41·658 (41)	22·353 (22)	22·353 (22)
VIII. Impregnated poles	Cubic Metre (1,000 cft.)	..	..	..	..	..	..	..	792·4 (28)	792·4 (28)	792·4 (28)
IX. Fences for rural use	Do.	1,312 (40)	1,132 (40)	1,132 (40)	1,499·9 (53)	1,631·4 (58)	1,613·1 (57)	1,669·7 (59)	2,009·3 (71)	1,754·6 (62)	1,896·1 (67)

(1) Excluding sleepers but including box boards.
(2) Coniferous and broadleaved species.
(3) Including veneers produced in match factories.
(4) Including dissolving grades made of other fibres than wood.

NOTE.—(i) Same as in notes (1) auditing Table 1.
(ii) The conversion factor used for charcoal.
1·016 metric tonnes (1 ton) charcoal.
4·064 metric tonnes (4 tons) firewood.
(200 cft.) 5·66 firewood.

TABLE 4.

INDIGENOUS SUPPLY OF SAWNWOOD (AVERAGE 1953—55) (*a*).

Country—Madras State, India. Unit—Cubic metre (1,000 cft.)

Category.	*Quantity.*
1. Coniferous sawnwood (*b*)	367·9* (13)
Recorded production (*a*)	....
Unrecorded production from forests and outside the forests.	....
2. Teak sawnwood (*b*)—	
Recorded production (*c*)	1,556·5 (55)
Unrecorded production from forests and outside the forests.	28·3 (1)
3. Other breadleaved sawnwood (*b*)—	
Recorded production (*c*)	3,877·1 (137)
Unrecorded production from forests and outside the forests.	6,084·5 (215)
4. Sawn sleepers (Coniferous and broadleaved)—	
Recorded production (*c*)	283 (10 †)
Unrecorded production from forests.	....
Total	12,197·3 (431)

(*a*) Including sleepers and box-boards.

(*b*) Excluding sleeper but including box-boards.

(*c*) See Table 3 (average 1953–55)

NOTE.—(i) Same as in note (i) and (ii) of Table 1.

(ii) Same as in note (iii) of Table 2.

* Figure for 1955–56 only.

† Average for 1954–55 and 1955–56 only.

TABLE 5.

Recorded Imports of Forests Products.

Country—Madras State, India.

Commodity.	*Unit in.*	1936–37 1938–39 *average.*	1947–48.	1948–49.	1949–50.	1950–51.	1951–52.	1952–53.	1953–54.	1954–55.	1955–56.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Fuelwood	Metric tonnes (tons).	194·065* (191)	..	..	50·02 (50)	..	5·080 (5)	..	..	15·241 (15)	1,557·605 (1533)
Wood for charcoal Pulpwood Coniferous saw and Veneer logs. Broadleaved saw and Veneer logs. Teak Other species	..	..	..	..	Nil.	..	..	..	..	..	..
Sleepers	Metric tonnes (tons).	89·412* (88·0)	..	.. ..	203 (0·2)	..	..	..	..	..	..
Coniferous sawnwood	Do.	24·385 (24)	..	..	..	..	..	..	..	1·524 (1·5)	..
Broadleaved sawnwood	(1,000	20,523·2	11,379·2	16,154·4	6,807·2	·5080	4,470·4	..	..	743·2	..
Teak	tons) M.T.	(20·2)	(11·2)	(15·9)	(6·7)	(0·5)	(4·4)			(2·7)	
Pulp and other paper material	Cubic metre (1,000 cft).	158·48 (5·6)	1,831·01 (64·7)	897·11 (31·7)	948·05 (33·5)	1,015·97 (35·9)	166·97 (5·9)	2·83 (0·1)	648·07 (22·9)	1,542·35 (54·5)	1,214·07 (42·9)
Mechanical pulp Dissolving grades Other chemical pulp	..	..	..	..	..	..	..	..	..	..	..
Veneers	Metric	500.912	..	..	..	..	..	..	..	..	..
Plywood	tonnes (tons).	(493)									
Insulating board hardwood	..	..	..	..	..	..	..	..	..	..	..

* This represents the imports in 1938–39 only as there were no imports in 1936–37 and 1937–38.

TABLE 5-A.

IMPORTS OF FOREST PRODUCT.

Country—Madras State, India.

Commodity.	*Unit in.*	1936–37 1938–39 *average.*	1947–48.	1948–49.	1949–50.	1950–51.	1951–52.	1952–53.	1953–54.	1954–55.	1955–56.
(1)	(2)	( )	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Resin-bonded particle board chip-board.	Cubic metre (1000 cft).	1208·41 (42·7)	232·06 (8·2)	107·54 (3·8)	229·23 (8·1)	11·32 (0·4)	62·26 (2·2)	331·11 (11·7)	121·69 (4·3)	673·54 (28·8)	710 3 (25·1)
Boxboards	Do.	..	..	..	..	..	..	..	..	..	..
Newsprint	Do.	6329·76 (227·2)	6376.37 (223·9)	8583·39 (303·3)	7063·68 (249·6)	10479·49 (370·3)	8360·77 (291·9)	6825·96 (241·2)	10313·18 (364·6)	15202·76 (537·2)	11393·58 (402·6)
Other printing and writing paper.	Do.	592·79 (21·3)	622·6 (22·0)	1[illegible]31·03 (54·1)	441·48 (15·6)	337·77 (11·9)	498·08 (17·6)	475·44 (16·8)	441·48 (15·6)	529·21 (18·7)	452·8 (16·0)
Wrapping paper	Do.	1193·51 (39·7)	243 38 (8·6)	1103·7 (39 0)	421·67 (14·9)	302·81 (10·7)	540·53 (19·1)	687 69 (24·3)	642·41 (22·7)	948·05 (33·5)	299·98 (10·6)
Other paper	Do.	412·68 (14 6)	982·01 (34·7)	498·08 (17·6)	520·72 (18·4)	710·33 (25·1)	568·83 (20·1)	203·76 (7·2)	189·61 (6·7)	99·05 (3·5)	195·27 (6·9)
Paper board	Do.	1151·81 (40·7)	232·06 (8·2)	76·41 (2·7)	563·17 (19·9)	11·32 (0·4)	Negligible.	331·11 (11·7)	121·69 (4·3)	671·54 (23·8)	710·33 (25·1)

Note.—(i) The details for 1935–36 are not available with the customs authorities and hence the average for column 3 has been calculated from **1936–37** to 1938–39 only.

TABLE 6.

RECORDS OF EXPORTER OF FOREST PRODUCTS.

Country—Madras State, India.

Commodity. (1)	*Unit in.* (2)	1936–37, 1938–39 *average.* (3)	1947–48. (4)	1948–49. (5)	1949–50. (6)	1950–51. (7)	1951–52. (8)	1952–53. (9)	1953–54. (10)	1954–55. (11)	1955–56. (12)
Fuelwood	..										
Wood for charcoal pulpwood.	..										
Coniferous saw and veneer logs.											
Broadleaved saw and veneer logs—	..										
Teak	..	..	..	..	..	..	..	..	..	..	..
Other species	..										
Pitprops	..										
Poles, piling, posts and other roundwood.	..										
Sleepers	..										
Coniferous sawnwood ..	..										
Broadleaved sawnwood ..											
Teak	Metric tonnes (ton).	2·032* (2)	..	..	..	33.530 (33)	..	..	1715·592 (1688)	..	6,096 (6)
Other Species		..	..	..	..	..	..	..	..	..	..
Pulp and other paper meterial	Cubic metre (1,000 cft).	22.64 † (0·8)	45·28 (1·6)	195·27 (6·9)	240·55 (8·5)	331·11 (11·7)	1443·3 (51)	..	..	701·84 (24·8)	1240·05 (43·5)
Mechanical pulp dissolving grades other chemical pulp Veneers.	Do.	..	..	..	..	..	..	..	..	..	..
Plywood—											
Insulating board		..	..	..	..	..	..	..	237·72 (8·4)	..	..

* This represents exports in 1936–37 only as no exports took place in 1937–38 and 1938–39.
† This represents exports in 1938–39 only as no exports took place in 1936–37 and 1937–38.

TABLE 6-A.

Recorded Ex orts of Forest Products.

Country—Madras State, India.

Commodity. (1)	*Unit in.* (2)	1936–37, 1938–39 *average.* (3)	1947–48. (4)	1948–49. (5)	1949–50. (6)	1950–51. (7)	1951–52. (8)	1952–53. (9)	1953–54. (10)	1954–55. (11)	1955–56. (12)
Hard Board	..	..	..	..	..	..	..	..	..	..	..
Resin-bonded particle board, (Chipboard) Boxboards.	Cubic metre (cft.)	8·2824 (382)	·7641 (27)	·9056 (32)	..	15·9895 (565)	..	·4094 (18)	·3962 (140)	20·093 (71)	Negligible.
Newsprint	Do.	·0283* (1·0)	..	..	..	..	·1132 (4)	..	·6792 (24)	7·0184 (248)	·6792 (24·0)
Other printing and writing paper, Wrapping paper.	..	..	..	..	..	..	..	..	..	..	..
Other paper	Do.	·1132 (40)	..	..	1·1037 (39)	..	..	·7924 (28)	1·0188 (36)	1·7546 (62)	5·06 (20)
Paper board	Do.	8·2541 (327)	..	·9056 (32)	..	..	..	222·5516 (7864)	4·1884 (148)	2·0093 (71)	.. ..

Note.—(i) * This represents exports in 1938–39 only as no exports took place in 1936–37 and 1937–38.

(ii) The details for 1935–36 are not available with the customs authorities and hence the average for column 3 has been calculated from 1936–37 and 1938–39 only.

TABLE 5-B/6-B.

UNRECORDED EXTERNAL TRADE OF FOREST PRODUCTS.

Country—Madras State, India.

Commodity.	Imports.					Exports.			
	Unit in 1000.	1952.	1953.	1954.	1955.	1952.	1953.	1954.	1955.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Pulpwood (*a*)									
Saw and Veneerings (*b*)									
Other Industrial wood (*c*)									
Coniferous sawnwood (*d*)									
Broadleaved sawnwood (*d*)					Nil.				
Pulp (*e*)									
Plywood and veners paper and board (*f*)									
Other commodities (*g*)									

(*a*) Include wood for charcoal.
(*b*) Include roundwood for sleepers.
(*c*) F.g. Pulpwood, pitprops, poles, piling, posts.
(*d*) Include boxboards.
(*e*) Include technical, dissolving and other chemical pulp.
(*f*) Include newsprint, other printing and writing paper, wrapping paper and paperboard.
(*g*) Include insulating board, hardboard, chipboard.

TABLE 7.

APPARENT CONSUMPTION (AVERAGE 1953/55) BY END OF USE FOREST PRODUCTS USED IN THE ROUND (PITPROPS AND "OTHER INDUSTRIAL WOOD").

Unit—Cubic Metre (1,000 cft.) Country—Madras State, India.

End use.	*Pitprops.*	*Other Industrial wood.*
(1)	(2)	(3)
Housing	..	11603·0 (410)
Non-residential construction ..	..	2943·2 (104)
Rural use (except new housing) ..	..	1811·2 (64)
Mining	..	..
Hewn sleepers	..	..
Ship building	..	28·3 (1)
Transmission poles	..	792·4 (28)
Others (i) Sandalwood	..	1754·6 (62)
(ii) Miscellaneous	..	481·1 (17)
Total	..	19413·8 (686)

(1) Give details please.

(2) Total consumption should equal total recorded and unrecorded production (table 2, items 3 and 4) plus imports of pitprops, poles, piling and posts of table 5a and 5b (average 1953/55), minus exports of pitprops, poles, piling and posts of tables 6a and 6b (average 1953/55.)

TABLE 8.

APPARTMENT CONSUMPTION OF SAWNWOOD BY END USES (AVERAGE 1953/55).

Unit—Cubic Metre (1,000 cft.) Country—Madras State, India.

End use.	*Coniferous sawnwood.*	*Sleepers.*	*Teak sawnwood.*	*Other broad leaved sawnood.*
(1)	(2)	(3)	(4)	(5)
Housing	56·6 (2)	..	7046·7 (249)	17008·3 (601)
Non-residential construction.	..	..	1556·5 (55)	3028·1 (107)
Mining	..	..	1499·9 (53)	2009·3 (71)
Sleepers	..	283·(10)	..	..
Vehicles	..	..	452·8 (16)	1332 (40)
Ship building	..	..	28·3 (1)	56·6 (92)
Furniture	..	..	1103·7 (39)	2603·6 (92)
Match industry	..	..	..	..
Other woodworking industries.	..	..	509·4 (18)	1669·7 (59)
Packaging	339·6 (12)	..	..	28·3 (1)
Other end use (1)	..	..	141·5 (5)	169·8 (6)
Total (2) ..	396·2 (14)	283 (10)	12338·8* (436)	27705·7 (979)**

(1) Give details please.

(2) Total consumption should equal recorded and unrecorded production (table 4) plus imports (average 1953/55) of tables 5 *a* and 5 *b*, minus exports (average 1953/55) of tables 6 *a* and 6 *b*.

NOTE.—* Production as per table 4 (56 units), plus imports in table 5a (45 units) exports in table 6a (28 units) plus imports from neighbouring states (i.e., Kerala 363 units).

** Production as per table 4 (352 units) plus imports from neighbouring states as Kerala (627 units) as imports and exports to other countries are Nil.

Other end use: (*a*) Teak sawnwood carvidg.

(*b*) Other board leaved sawnwood carving.

TABLE 9.

Apparent consumption (average 1953/55) by end uses of Veneers and Plywood.

Country—Madras State, India.

End use.	*Veneers unit cubic metre (1,000 cft.) round wood.*	*Plywood unit (1,000 sq. ft.)*		
(1)	(2)	(3)		
Housing	Nil.	63,900	sq. metres.	(710)
Non-residential construction	Nil.	114,300	,,	(1,270)
Vehicles	Nil.	7,560	,,	(84)
Ship building	Nil.	Nil.	..	..
Furniture	Nil.	12,060	..	(134)
Match industry	1,415 c.m. (500 cft.).	Nil.	..	..
Other wood-working industries	Nil.	15,120	..	(168)
Packaging	Nil.	10,980	,,	(122)
Other end-use (*a*)	Nil.	8,100	,,	(90)
Total (b) ..	1415 (500)	249,320	,,	(2,768)

(*a*) Give details please (e.g. aviation).

(*b*) Total consumption should equal total production (table 3, items iii and iv) (average 1953/55) PLUS imports [tables 5 (a) and 5 (b) average 1953/55] minus exports [tables 6 (a) and 6 (b) average 1953/55].

Note.—(i) The export of 8,400 cuts of plywood in 1953–54 has been done throughout the ports of this state by the manufacturing firms in Kerala State, who have their branch offices in this State.

(ii) Since plywood is not manufactured in this State, the total quantity consumed, viz., 2,762 units are imported from the neighbouring States as Kerala.

Other end uses : Toy Industry, Cinema Industry, etc.

TABLE 10-a.

Balance of supply and consumption of bamboo for industrial purposes (1) (average 1953/55).

Country—Madras State, India. Unit Metric tonnes (Tons).

Supply.			*Consumption.*		
Sources.	*Quantity.*		*Destination.*	*Quantity.*	
(1)	(2)		(3)	(4)	
1. Indigenous production.	9,976·594	(9,819)	1. Housing	3,770·562	(3,711)
2. Imports	Nil.		2. Non-residential construction.	2,517·772	(2,478)
			3. Rural use	2,102·207	(2,069)
			4. Packaging (including basket).	1,246·693	(1,227)
			5. Furniture	82·300	(81)
			6. Other wood-working industries.	68·075	(67)
			7. Transport (including rafting).	39·626	(39)
			8. Other end uses (3) ..	149·359	(147)
			9. Exports	Nil.	..
Total (2)	9,976·594	(9,819)	Total(2) ..	9,976·594	(9,819)

1. Exclude bamboo for fuel purposes and for pulping.
2. Total for supply should equal total for consumption.
3. Give details please.

Note.—(i) The conversion factors used are :—
200 big bamboos—1 ton.
320 small bamoos—1 ton.
(ii) Other end uses are fancy article carving, etc.

TABLE 10-B.

BALANCE OF SUPPLY AND CONSUMPTION OF PALM SPECIES FOR INDUSTRIAL PURPOSES (AVERAGE 1953/55).

Country—Madras State, India.

Supply.			*Consumption.*		
Sources.	*Unit.*	*Quantity.*	*Destination.*	*Unit.*	*Quantity.*
(1)	(2)	(3)	(4)	(5)	(6)
1. Indigenous production.	Metric tonnes (tons).	29,783·473 (29,313)	1. Housing ..	Metric tonnes (tons).	7,432·406 (7,315)
			2. Non-residential construction.	„	3,332·644 (3,280)
2. Imports ..		Nil.	3. Rural use ..	„	16,811·563 (16,546)
			4. Other uses (2)	„	2,206·860 (2,172)
			5. Exports ..	„	Nil.
Total (1) ..		29,783·473 (29,313)	Total (1) ..		29,783·473 (29,313)

(1) Total for supply should be equal total for consumption.
(2) Give details please.

NOTE.—(i) The conversion factors used are :
Palmyrah and coconut palm .. .. .. 1 ton—6 trees.
Areca palm .. .. 1 ton – 50 trees.
(ii) Other end uses : Are furniture, electrical transmission, poles, etc.

TABLE 11.

BALANCE OF SUPPLY AND CONSUMPTION OF FUELWOOD (AVERAGE 1953/55).

Country—Madras State, India. Unit—Cubic Metre (1,000 cft.).

Supply.		*Consumption.*	
Source.	*Quantity.*	*Source.*	*Quantity.*
(1)	(2)	(3)	(4)
Recorded production.	173,950·1 (6,147)	Households ..	7,151,523·2 (252,704)
Unrecorded production—From forests (*c*).	43,497·1 (1,537)	Other non-industrial uses (*h*).	983,340·1 (34,747)
From outside the forests (*b*).	6,066,076·7 (214,349)	Railways and boats.	53,628·5 (1,895)
Industrial woodwaste,	4,046·9 (143)	Industries (*i*) ..	750,912·2 (26,534)
From outside India.	735·8 (26)	Exports (*j*) ..	Nil.
Imports (*f*)—From other states in India.	2,651,087·4 (93,678)		
Total (*g*) ..	8,939,404·0 (315,880)	Total (*g*) ..	8,939,404·0 (315,880)

(*a*) Excludes bamboo and fuelwood for charcoal production.
(*b*) *See* table (1) (Item 5, average 1953/55, deducting, however, amount used for charcoal making).
(*c*) Includes state and other forests.
(*d*) Include tree-growth in villages, on roads, canals, estates, orchards, etc.
(*e*) Sawdust, off-cuts, shaves, bark, etc.
(*f*) *See* tables 5(a) and 5 (b)(average 1953/55).
(*g*) Total of supply should equal total of consumption.
(*h*) Include hotels, schools, estates, etc.
(*i*) Include cottage industries.
(*j*) *See* tables 6(a) and 6(b) (average 1953/56).

NOTE.—The conversion factor used is 1 ton of firewood—50 cft.

(1,016 Metric tonnes.) (1,415 Cubic metre.)

TABLE 12.

BALANCE OF SUPPLY AND CONSUMPTION OF CHARCOAL (AVERAGE 1953/55).

Country—Madras State, India. Unit—Metric tonnes.

Supply.		*Consumption.*	
Source.	*Quantity.*	*Destination.*	*Quantity.*
(1)	(2)	(3)	(4)
Recorded production. (*a*)	28·449 (28)	Households ..	69,966·219 (68,861)
Unrecorded production.	69,389·102 (68,293)	Other non-industrial uses (*d*).	11,230·400 (11,053)
Imports (*b*)	..	Railways ..	Nil.
(i) From outside India.	Nil.	Industries ..	14,573·205 (14,343)
(ii) From other states in India.	26,352·253 (25,936)	Exports (*e*) ..	Nil.
Total (*c*) ..	95,769·824 (94,257)	Total (*c*) ..	95,769·824 (94,257)

(*a*) *See* table 3 item VII (average 1953/56).

(*b*) *See* tables 5(a) and 5(b) (average 1953/55).

(*c*) Total of supply should equal total of consumption.

(*d*) Include hotels, schools, estates.

(*e*) *See* tables 6(a) and 6(b) (average 1953/55).

TABLE 13.

BASIC ASSUMPTIONS UNDERLYING MAXIMUM AND MINIMUM FORECASTS.

Country—Madras State, India.

Economic Growth.	*Unit.*	*Minimum.*			*Maximum.*		
(1)	(2)	(3)			(4)		
		1960	1970	1975	1960	1970	1975
Annual rate of increase of national income per capita.	Per cent.	..	2·2 *	..	..	4·0 †	..
Population	Millions.	34·06	39·01	41·76	34·17	39·17	42·91
Percentage increase over 1953/55.	Do.	8·5	24·3	33·0	8·9	26·7	36·7
National Income—Percentage increase over 1953/55.	Do.	19·04	51·7	68·0	28·8	107·3	160·7
Agricultural output—Percentage increase over 1953/55.	Do.	13·8	41·4	57·6	21·5	57·2	75·0
Industrial output—Percentage increase over 1953/55.	Do.	48·0	128·0	168·0	77·8	204·8	268·8

NOTE.—If any of the figures indicated in the table correspond to furnished plan figures, please indicate. If plan figures exist, but have not been utilised in this table, please give here a short summary of the plan figures.

* This is based on the figures for the First Five-Year Plan for India.

† This is based on the figures for the Second and Third Five-Year Plans for India.

TABLE 14.

FUTURE REQUIREMENT OF ROUNDWOOD AND ITS PRODUCTS IN HOUSING, NON-RESIDENTIAL CONSTRUCTION AND RURAL USE.

Country—Madras State, India.

Category.	Unit.	1953/55.	1960.		1970.		1975.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Housing (a)—								
Sawnwood	Cubic metre (1,000 cft.)	24,111.6 (852)	26,517.1 (937)	30,139.5 (1,065)	28,922.6 (1,022)	38,572.9 (1,363)	30,139.5 (1,065)	42,167·0 (1,490)
Veneers	Do.	Nil.	..	28.3 (1)	56.6 (2)	113.2 (4)	84.9 (3)	141·5 (5)
Plywood	Do.	20,093.0 (710)	22,102.3 (781)	25,130.4 (888)	24,111.6 (852)	32,148.8 (1,136)	25,130.4 (888)	35,997.6 (1272)
Other industrial wood.	Do.	11,603.0 (410)	12,763.3 (451)	14,517.9 (513)	13,923.6 (492)	18,564.8 (659)	14,517.9 (513)	20,291.1 (717)
Bamboo	Metric tonnes. (ton)	3,870.562 (3,711)	4,148.532 (4,083)	4712.440 (4,638)	4,524.470 (4,453)	6,032·284 (5,937)	4,712.440 (4638)	6,598.228 (6,494)
Palm trees	Do.	7,432.406 (7,315)	8,175.138 (8,046)	9289·745 (9,143)	8,918.887 (8,778)	11,887.785 (11,700)	9,289.745 (9143)	13,005.44 (12,800)
Non-Residential Construction (a)—								
Sawnwood	Cubic metre (1,000 cft.)	4,584.6 (162)	5,037.4 (178)	5,744·9 (203)	5,490.2 (194)	7,329.7 (259)	5,744.9 (203)	8,008·9 (283)
Veneers	Do.	Nil.	..	113.2 (4)	56 6 (2)	113.2 (4)	84.9 (3)	141.5 (5)
Plywood	Do	35,941.0 (1,270)	39,535.1 (1,397)	44,940.4 (1,588)	43,129.2 (1,524)	57,505.6 (2,032)	39,535.1 (1,588)	62,995.8 (2226)
Other industrial wood	Do.	2,943.2 (104)	3,226.2 (114)	3,679·0 (130)	3,537.5 (125)	469.78 (166)	3,679.0 (130)	5,150.6 (182)
Bomboo	Metric tonnes. (tons)	2,517.772 (2,478)	2,769.752 (2,726)	3,126.707 (3,097)	3,021.732 (2,974)	4,028·638 (3,965)	3,126.707 (3,097)	4,405.593 (4,336)
Palm trees	Do.	3,332.644 (3,280)	3,665.908 (3,608)	4,166.821 (4,101)	4,000.189 (3,937)	5,332.235 (5,248)	4,166.821 (4,101)	5,832.127 (5,740)

TABLE 14—*cont.*

FUTURE REQUIREMENT OF ROUNDWOOD AND ITS PRODUCTS IN HOUSING, NON-RESIDENTIAL CONSTRUCTION AND RURAL USE—*cont.*

Country :—Madras State, India.

Category.	Unit.	1953–55.	1960.		1970.		1975.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Rural Use—								
Sawn wood	Cubic metre (1,000 cft.)	3,509.2 (124)	3,848.8 (136)	4,386.5 (155)	4,216.7 (149)	5,603·4 (198)	4,386.5 (155)	6,141.1 (217)
Other industrial wood	Do.	1,811.2 (64)	1,981 (70)	2,264.0 (80)	2,179.1 (77)	2,914.9 (103)	2,264.0 (80)	3,169.6 (112)
Bomboo	Metric tonnes (ton).	2,102.207 (2069)	2,241.406 (2,206)	2,627.505 (2,586)	2,522.852 (2,483)	3,364.142 (3,311)	2,627.505 (2,586)	3,657.78 (3,621)
Palm trees	Do.	16,811.563 (16,546)	18,502.270 (18,210)	21,011.914 (20,680)	20,178.753 (19,860)	26,905.004 (2,6480)	21011.914 (20,680)	29,424.808 (28,960)

(*a*) Including repairs.

1. Minimum estimate.

2. Maximum estimate.

TABLE 15.

FUTURE REQUIREMENTS OF ROUNDWOOD AND ITS PRODUCTS IN MINING AND PACKING.

Country—Madras State, India.

Category.	*Unit.*	1953/55	1960		1970		1975	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mining								
Pitprops	Cubic metre (1,000 cft.)	Nil.	..	28.3 (1)	56.6 (2)	113.2 (4)	84.9 (8)	141.5 (5)
Sawnwood	do.	Nil.	28.3 (1)	56.6 (2)	84.9 (3)	141.5 (5)	113.2 (4)	169.8 (6)
Packing								
Sawnwood	Cubic metre (1,000 cft.)	367.9 (13)	396.2 (14)	452.8 (16)	424.5 (15)	566 (20)	452.8 (16)	622.6 (22)
Veneers	Sq. metre (1,000 sq.ft.)	Nil.	..	90 (1)	180 (2)	360 (4)	270 (3)	450 (5)
Plywood	Do.	10980 (122)	12060 (134)	13680 (152)	13140 (146)	175550 (195)	13680 (152)	19170 (213)
Bamboo	Metric tonnes (ton).	1246.693 (1227)	1371.667 (1350)	1557.605 (1533)	1495.625 (1472)	1994.506 (1963)	1557.605 (1533)	2181.459 (2147)

Columus (4), (6) and 8 Minimum estimate.

Columus (5), (7) and 9 Maximum estimate.

TABLE 16.

FUTURE REQUIREMENTS OF ROUNDWOOD AND ITS PRODUCTS IN TRANSPORT AND COMMUNICATIONS.

Country—Madras State, India.

Category.	Unit.	1953/55	1960		1970		1975	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sleepers—								
Sawnwood	Cubic metre (1,000 cft.)	283.0 (10)	311.3 (11)	367.9 (13)	339.6 (12)	452.8 (16)	367.9 (1[illegible])	509.4 (18)
Other industrial wood.	Do.	Nil.	..	28.3 (1)	28.3 (1)	84.9 (3)	56.6 (2)	113.2 (4)
Vehicles—								
Sawnwood	Cubic metre (1,000 cft.)	1584.8 (56)	1754.6 (62)	1981 (70)	1896.1 (67)	2518.7 (89)	1981 (70)	2773.4 (98)
Veneers	Sq. metres. (1,000 sq. ft.)	..	..	90 (1)	180 (2)	360 (4)	270 (3)	450 (5)
Plywood	Do.	4860 (84)	8280 (92)	9450 (105)	9040 (101)	12150 (135)	9450 (105)	13230 (147)
Ship Building—								
Sawnwood	Cubic metre (1,000 cft.)	84·9 (3)	84.9 (3)	113 2 (4)	113.2 (4)	141.5 (5)	113.2 (4)	141.5 (5)
Veneers	Sq. metre (1,000 sq. ft).	Nil.	..	90 (1)	180 (2)	360 (4)	270 (3)	450 (5)
Plywood	Do.	Nil.	..	90 (1)	180 (2)	450 (5)	270 (3)	540 (6)
Other industrial wood	Cubic metre (1,000 cft.)	28.3 (1)	28.3 (1)	28.3 (1)	28.3 (1)	56.6 (2)	28.3 (1)	56.6 (2)
Transmission Poles—								
Other industrial wood	Cubic metre (1,000 cft.)	792.4 (28)	877.3 (31)	990.5 (35)	962.2 (34)	1273.5 (45)	990.5 (35)	1386.7 (49)

Columus (4), (6) and (8) Minimum estimate.
Columus (5), (7) and (9) Maximum estimate.

TABLE 17.

FUTURE REQUIREMENTS OF ROUNDWOOD AND ITS PRODUCTS IN THE WOOD-WORKING INDUSTRIES.

Country—Madras State, India.

Category.	*Unit.*	1953/55	1960		1970		1975	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(6)
Furniture								
Sawnwood	Cubic metre (1,000 cft.)	3707.3 (131)	4075.2 (144)	4631.2 (164)	4443.1 (157)	5914.7 (209)	4631.2 (164)	6509.0 (230)
Veneers	Sq. metres (1,000 sq. ft.)	Nil.	..	90 (1)	180 (2)	360 (4)	270 (3)	450 (5)
Plywood	do.	12060 (134)	13160 (147)	15030 (167)	14490 (161)	19350 (215)	15030 (167)	21260 (234)
Bamboo	Metric tonnes (ton).	82.300 (81)	90.428 (89)	102.621 (101)	98.557 (97)	131.070 (129)	102.621 (101)	143.263 (141)
Match Iudustry								
Swanwood	Cubic metre (1,000 cft.)	Nil.	28·3 (1)	56·6 (2)	56.6 (2)	113.2 (4)	84.9 (3)	169.8 (6)
Veneers	Sq. metres (1,000 sq. ft.)	45000 (500)	49[illegible]00 (550)	56250 (625)	54000 (600)	72000 (800)	56250 (625)	78750 (875)
Plywood	do.	..	..	..	..	..	..	..
Otherwood working Industries								
Sawnwood	Cubic metres (1,000 cft.)	2179.1 (77)	2405·5 (85)	2716.8 (96)	2603.6 (92)	3480.9 (123)	2716.8 (96)	3792·2 (134)
Veneers	Sq. metre (1000 sq. ft.)	Nil.	..	90 (1)	180 (2)	360 (4)	270 (3)	450 (5)
Plywood	do.	15120 (168)	16650 (185)	18900 (210)	18000 (200)	23760 (264)	18900 (210)	27460 (294)
Bamboo	Metric tonnes (ton).	68.075 (67)	75.187 (74)	85.348 (84)	81.284 (8[illegible])	107.701 (106)	85.348 (84)	130.054 (128)

1. Minimum estimate.
2. Maximum estimate.

TABLE 18.

FUTURE REQUIREMENTS OF ROUNDWOOD AND ITS PRODUCTS IN OTHER IN OUSTRIES.

Country—Madras State, India.

Category.	Unit.	1953/55.	1960		1970		1975	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Other Industries.—								
Sawnwood	Cubic metre .. (1000 cft.) ..	311·3 (11)	339·6 (12)	396·2 (14)	367·9 (13)	481·1 (17)	396·2 (14)	537·7 (19)
Veneers	Sq. m tre .. (1000 sq. ft) ..	nil.	..	90 (1)	180 (2)	360 (4)	270 (3)	450 (5)
Plywood	do. ..	8100 (90)	8910 (99)	10710 (119)	9720 (108)	12960 (144)	10710 (119)	14130 (157)
Bamboo	Metric tonnes .. (ton).	188·965 (186)	208·290 (205)	235·724 (232)	226·579 (223)	301·767 (297)	235·72 (232)	331·232 (326)

1 Minimum estimate.
2 Maximum estimate.

TABLE 19.

Future Requirements of Fibrewood, Chipboard, Paper and Board.

Country—Madras State, India.

Category.	*Unit.*	1953/55	1960		1970		1975	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fibreboard and Chipboard*								
Fibreboard .. .. / Hard and Semihard / Insulating .. .. / Chipboard	Cubic metre (1000 cft.) ..	687·61 (24·3)	755·61 (26·7)	866·32 (30·4)	826·36 (29·2)	1100·87 (38·9)	866·72 (30·4)	1207·5 (42·5)
Paper and Board—								
Newsprinting ..	Cubic metre (1000 cft.) ..	12302·01 (434·7)	13533·06 (478·2)	15378·22 (543·4)	14764·11 (521·7)	19682·65 (695·5)	15378·22 (543·4)	21527·8 (760·7)
Other printing and writing.	do.	1901·76 (67·2)	2091·37 (73·9)	2377·2 (84·0)	2280·98 (80·6)	3042·25 (107·5)	2377·2 (84·0)	3328·08 (117·6)
Packing and writing paper.	do. ..	2818·68 (99·6)	3101·68 (109·6)	3526·18 (124·6)	3381·85 (119·5)	45[illegible]8·19 (159·3)	3526·18 (124·6)	4932·68 (174·3)
Other paper	do. ..	673 54 (23·8)	731·46 (26·2)	843 34 (29·8)	809·38 (28·6)	1077·23 (38·1)	843·34 (29·8)	1180·11 (41·7)
Paper board	do. ..	1992·32 (70·4)	2193 25 (77·5)	2490·4 (88·0)	2391 35 (84·5)	3189·41 (112·7)	2490 14 (88·0)	3486 56 (123·2)

Minimum Estimate.

Maximum Estimate.

Note—* Details for individual items are not available with the customs authorities.

TABLE 20.

Future Requirements of Firewood and Charcoal.

Country—Madras State, India.

Category.	Unit.	1953/55.	1960		1970		1975	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Fuelwood—								
Households	Cubic metre (1000 cft.) ..	7151523·2 (252704)	7867400 (278000)	8939970 (315900)	7867400 (278000)	10725700 (379000)	7867400 (278000)	11438860 (404200)
Other non-industrial uses.	do. ..	983340·1 (34747)	1081626 (38220)	1229069 (43430)	1081626 (38220)	1474996 (52120)	1081626 (38220)	1578000 8 (55760)
Railways	do. ..	53628·5 (1895)	58977·2 (2084)	67042·7 (2369)	58977·2 (2084)	80456·9 (2848)	58977·2 (2084)	85635·8 (3026)
Industries	do. ..	750902·2 (26534)	825794 (29180)	938428 (33160)	825794 (29180)	1126057 (397690)	825794 (29180)	12010520 (424400)
Charcoal—								
Households	Metric tonnes (ton.) ..	69966·219 (68861)	76996·264 (75780)	87502·226 (86120)	76996·264 (75780)	111765·5 (110000)	76996·264 (75780)	111968·710 (110200)
Other non-industrial uses.	do. ..	11230·400 (11053)	12345·007 (12150)	14031·620 (13810)	12345·007 (12150)	11816·661 (11360)	12345·007 (12150)	24629·052 (24240)
Railways	do. ..	nil.	..	..	..	..	..	..
Industries	do. ..	14573·205 (14343)	16023·108 (15770)	18217·776 (17930)	16023·108 (15770)	21885·717 (21540)	16023·108 (15770)	23308.187 (22940)

1 Minimum Estimate·

2 Maximum Estimate.

TABLE 21.

Total Internal Requirements of Roundwood and its Products

Country—Madras State, India.

Commodity.	*Unit.*	1953/55	1960. 1	1960. 2	1970. 1	1970. 2	1975. 1	1975. 2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sawnwood (Including sawn sleepers).	Cubic metre. (1000 cft.)	40723·7 (1439)	44827·2 (1584)	51053·2 (1804)	48959 (1730)	65118·3 (2301)	51279·6 (1812)	11542·4 (2528)
Veneers	Do.	14150 (500)	15593·3 (551)	17913·9 (633)	17432·8 (616)	23545·6 (832)	18366·7 (649)	25894·5 (915)
Plywood	Sq. metre. (1000 sq. ft.)	232020 (2578)	255150 (2835)	290700 (3230)	278460 (3094)	371840 (4126)	290880 (3232)	409410 (4549)
Newsprint	Cubic metre. (1000 cft.)	12386·91 (437·71)	13533·06 (478·2)	15388·22 (543·4)	14764·11 (521·7)	19682·65 (695·5)	15388·22 (543·4)	21527·81 (760·7)
Other paper	Do.	5139·28 (181·6)	5934·51 (209·7)	6746·72 (238·4)	6472·21 (228·7)	8628·67 (304·9)	6463·72 (228·4)	9439·88 (333·6)
Paperboard	Do.	1992·32 (70·4)	2193·25 (77·5)	2490·4 (88·0)	2391·35 (84·5)	2189·41 (112·7)	2490·4 (88·0)	3486·56 (123·2)
Fibre board	Do.	687·69 (24·3)	755·61 (26·7)	860·32 (30·4)	826·36 (29·2)	1100·87 (38·9)	860·32 (30·4)	1202·75 (42·5)
Pitoprops	Do.	..	..	28·3 (1)	..	113·2 (4)	84·5 (3)	141·5 (5)
Other industrial Wood (a)	Do.	17178·1 (607)	18876·7 (667)	21508·0 (760)	20659·0 (730)	27026·5 (955)	21536·3 (761)	30167·8 (1066)
Bamboo (b)	Metric tonnes (ton).	9976·595 (9819)	10465·35 (10300)	12466·933 (12270)	11979·229 (11790)	15992·627 (15740)	12466·933 (12270)	17455·739 (17180)
Palm trees	Do.	29783·474 (29313)	32757·452 (32240)	37228·062 (36640)	35744·630 (35180)	47642·584 (46890)	37228·062 (36640)	52113·204 (51290)
Fuelwood	Cubic metre. (1000 cft.)	8939404 (315880)	9731420 (347400)	11175670 (394900)	9731420 (347400)	13411370 (473900)	9731420 (347400)	14302820 (505400)
Charcoal	Metric tonnes (ton).	95769·825 (94257)	105364·385 (103700)	119792·295 (117900)	105364·385 (103700)	143771·075 (141500)	105364·385 (103700)	15332·945 (150900)

1. Minimum Estimate. 2. Maximum Estimate.
(a) Including transmission poles and sawn sleepers.
(b) Excluding quantities used for fuel and for pulping.

TABLE 22.

Country—Madras State India.

Unit :—Cubic metre. (1000 cft.).

Commodity.	*Conversion factor used.*	1953/55	1960. 1	1960. 2	1970. 1	1970. 2	1975. 1	1975. 2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sawnwood (including sawn sleepers).	2·00	81447·4 (2878)	89654·4 (3168)	102106·4 (3608)	97918 (3460)	130236·6 (4602)	101559·2 (3624)	143084·8 (5056)
Vaneers *	1·0	14150 (500)	15565 (550)	17913·9 (633)	17432·8 (616)	23545·6 (832)	18366·7 (649)	25894·5 (915)
Plywood	1/28·8	2532·85 (89·5)	2787·55 (98·5)	3172·43 (112·1)	3039·42 (107·4)	4052·56 (143·2)	3175·26 (11·2)	4471·4 (158·0)
Newsprint .. .. .. } (**)								
Other paper .. .. } (**)								
Paper board .. .. } (**)								
Fibre board .. .. } (**)								
Pitprops	1·0	..	..	28·3 (1)	56·6 (2)	113·2 (4)	84·9 (3)	141·5 (5)
Other industrial round wood (*a*)	1·0	17178·1 (607)	18876·1 (667)	21508 (760)	20659 (730)	27026·5 (955)	21536·3 (761)	30167·8 (1066)
Fuelwood	1·0	8939404 (315880)	9831420 (347400)	11175670 (394900)	9831420 (347400)	13311370 (473900)	9831420 (347400)	14302820 (505400)
Charcoal	0·2	533483·3 (18851)	2934710 (103700)	3336570 (117900)	2934710 (103700)	4004450 (141500)	2934710 (103700)	4370470 (150900)

1. Minimum. 2. Maximum. (*a*) Including transmis ion poles and sawn sleepers.

* For conversion, 1000 sq. ft. of plywood has been assumed to yield 34·7 cft.—·98201 Cubic metre round wood, i.e.,

1000 sq. ft.—90 sq. metre—plywood. 982 1 cubic metre (34·7 cft.)

$\frac{1000 \times 1000}{34{\cdot}7}$—1000 cft. is 28,800 sq. ft.—1000 cft. Therefore the conversion factor is 1/28·8.

** Details not available with the customs authorities or marchants sin e they are not manufactured in this State. The round wood used for the manufacture will not affect the total internal requirements of round wood and its products.

TABLE 23-A.

TOTAL INTERNAL REQUIREMNTS OF ROUNDWOOD AND ITS PRODUCTS.

Country—Madras State, India.

Commodity.	*Pulp content per unit used in the Table 21.*	1953/55	1960.		1970.		1975.	
			1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Newsprint.—								
Mechanical pulp ..	70%	8611·407 (304·29)	9473·142 (334 74)	10764·754 (385·38)	10334·877 (365·19)	13777·855 (486·85)	10764·754 (380·38)	15069·467 (532·49)
Chemical pulp ..	30%	3690·603 (130·41)	4059 918 (143·46)	4623·466 (163·02)	4429·233 (156·51)	5904·795 (208·65)	4623·466 (168·02)	64158·343 (228·21)
Other Paper. *—								
Mechanical pulp ..								
Chemical pulp ..								
Paperboard. *—								
Mechanical pulp ..								
Chemical pulp ..								
Fibreboard. *—								
Mechanical pulp ..								
Artificial Fibre *								
Total ..								
Mechanical pulp ..								
Chemical pulp ..								

1. Minimum estimate.
2. Maximum estimate.
* Details not available with the customs authorities or the merchants importing them.

TABLE 23-B. *

TOTAL INTERNAL REQUIREMENTS OF MECHANICAL AND CHEMICAL PULP EXPRESSED IN TERMS OF RAW MATERIAL.

Country :—Madras State, India.

Raw material.	*Raw material equivalent per unit of mechanical pulp used in table* 23 (A).	1953/55.	1960		1970		1975	
			1	2	1	2	1	2
Coniferous pulpwood broadleaved pulpwood woodwaste and others (*a*).								
	Raw material equivalent per unit of chemical pulp used in table 23 (1).							
Coniferous pulpwood.								
Broadleaved pulpwood.								
Woodwaste.								
Bamboo.								
Reeds.								
Rice straw.								
Bagasse.								
Others (*a*).								

(*a*) Give details please.

1. Minimum estimate.

2. Maximum estimate.

* Details for this table cannot be calculated as table 23 (A) is incomplete.

TABLE 24.

TOTAL EXPORT AVAILABILITY OF ROUNDWOOD AND ITS PRODUCTS.

Country :—Madras State, India.

Commodity.	*Unit.*	1953–55	1960. 1	1960. 2	1970. 1	1970. 2	1975. 1	1975. 2	*Principal market at present.*	*Prospected.*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Sawn wood (including sawn sleepers).	Metric tonnes (ton).	574·068 (565)	Nil.	574·068 (565)	Nil.	574·068 (565)	Nil.	574·068 (565)	Eastern countries.	Same.
Plywood and Veneers ..	Cubic metre (1,000 cft.).	79·24 (2·8)	,,	79·24 (2·8)	,,	79·24 (2·8)	,,	79·24 (2·8)		
Newsprint	Cubic metre (cft.)	2·79321 (98·7)	,,	2·79321 (98·7)	,,	2·79321 (98·7)	,,	2·79321 (98·7)		
Other paper	Do.	1·18389 (39·3)	,,	1·18389 (39·3)	,,	1·18389 (39·3)	,,	1·18389 (39·3)		
Paper board	Do.	2·0 59 (73·0)	,,	2·0659 (73·0)	,,	2·0659 (73·0)	,,	2·0659 (73·0)		
Fibre board	Do.	1·981 (70·0)	,,	1·981 (70·0)	,,	1·981 (70·0)	,,	1·981 (70·0)		
Pitprops	Cubic metre (1,000 cft.)	..	..	..	..	..	..	..	..	..
Other industrial wood (*a*)	Do.									
Bamboo (*b*)	Do.									
Palm trees	Do.									
Fuel wood	Do.									
Charcoal	Do.									

1. Minimum estimate. 2. Maximum estimate.

(*a*) Including transmission poles and sawn sleepers.

(*b*) Excluding quantities used for fuel and for pulping.

TABLE 25.

TOTAL EXPORT AVAILABILITY OF ROUNDWOOD AND ITS PRODUCTS EXPRESSED IN ROUNDWOOD EQUIVALENT.

Country :—Madras State, India. Unit :—Cubic metre. (1,000 cft.

Commodity.	*Conversion factor used.*	1953/55.	1960.		1970.		1975.	
			1	2	1	2	1	2
Sawnwood (including sawn sleepers).	0·1	1,598·95 (56·5)	Nil.	1,598·95 (56·5)	Nil.	1,598·95 (56·5)	Nil.	1,598·95 (56·5)
Plywood and Veneers	..	..	..	..	..	..	..	..
Newsprint (*a*)*								
Other paper (*a*) *								
Paper board (*a*) *								
Fibre board (*a*) *								
Pitprops .. .. / Other industrial wood (*b*) / Fuel wood .. / Charcoal ..	..	..	..	..	..	..	..	..
Total	..	..	..	..	..	..	..	..
Bamboo for pulping / Bamboo for other purposes. / Palm trees .. / Reeds for pulping	..	..	..	..	..	..	..	..
Rises straw for pulping / Bagasse for pulping / Other raw materials for pulping (*c*).	..	..	..	Nil.	..	..	..	..

1. Minimum estimate.

2. Maximum estimate.

(*a*) Include only quantities stemming from wood (e.g., Pulpwood, Woodwaste).

(*b*) Include transmission poles and hewn sleepers.

(*c*) Give details please.

Conversion forms :—(i) Sawn wood : 1 ton (1·016 metric tonnes) = 1·4150 cubic metre. (50 cft.) or

2·83 cubic metre. (100 cft.) roundwood if 50 per cent outturn is assumed or

10·16 metric tons (10 tons) 28·3 cubic metre (1,000 cft.).

Therefore the conversion factor is 1/10 or 0·1.

NOTE.—* Details of conversion factor used are not available.

TABLE 26.

ESTIMAMED RAW MATRRIAL SUPPLY IN 1960, 1970 AND 1975.

Country—Madras State, India.

Source.	Unit.	1953/55 (a)		Normal estimate. 1 60		1970	
		1	2	1	2	1	2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Roundwood—							
From existing forests in use.	Cubic metre (1000 cft.)	14,291·5 (505)	217,627·0 (7,690)	14,291·5 (505)	217,627·0 (7,690)	15,720·65 (555·5)	261,152·4 (9,228)
Forests nowadays accessible but unexploited.	Do.	..	..	..	..	..	..
Nowadays inaccessible forests.	Do.	..	..	283 (10)	4,358·2 (154)	1,429 15 (50·5)	21,762·7 (769)
Afforestation	Do.	..	..	..	..	..	21,762·7 (769)
Trees outside the forests ..	Do.	42,874·5 (1,515)	6,452,626·4 (228,008)	42,874·5 (1,515)	6,452,626·4 (228,008)	42,874·5 (1515)	6,452,626·4 (228,008)
Improved logging operations	Do.	..	..	..	..	..	..
Industial wood waste ..	Do.	..	4,046·9 (143)	..	4,046·9 (143)	1,018·8 (36)	3,396 (120)
Bomboo from existing forests in use.	Metric tonnes (tons)	9,976·595 (9,819)	..	..	..	10.984·517 (10,811)	..
New areas	Do.	..	..	199·146 (199)	..	997·761 (982)	..
Palm trees	Do.	..	..	..	..	..	..

TABLE 26—*cont.*

ESTIMATED RAW MATERIAL SUPPLY IN 1960, 1970 AND 1975—*cont.*

Country :—Madras State, India.

Source.	*Unit.*	1975		*Maximum estimate.* 1960		1970		1975	
		1	2	1	2	1	2	1	2
Roundwood—									
From existing forests in use.	Cubic metre (1000 cft.)	15,720·65 (555·5)	261,152·4 (9,228)	14,291·5 (505)	217,621 (7,690)	17,149·8 (606)	307,790·8 (10,876)	17,149·8 (606)	307,790·8 (108,76)
Forests nowadays accessible but unexploited.	do.	..	..	..	..	..	..	..	..
Nowadays inaccessible forests	Do.	1,429·15 (50·5)	21,762·7 (769)	715·99 (25·3)	10,895·5 (385)	2,858·3 (101)	43,525·4 (1,538)	2,858·3 (101)	43,525·4 (1,538)
Afforestation	Do.	..	..	..	..	..	43,525·4 (1,538)	..	43,525·4 (1,538)
Trees outside the forests ..	Do.	42,874·5 (1,515)	6,452,626·4 (228,008)	42,874·5 (1,515)	6,452,626·4 (228,008)	42,874.5 (1,515)	6,452,626·4 (228,008)	42,874·5 (1,515)	6,452 626·4) (2,220,08
Improved logging operations.	Do.	..	..	..	..	..	..	..	..
Industrial woodwaste ..	Do.	1,301·8 (46)	3,424·3 (121)	..	4,046·9 (143)	1,415 (5[illegible])	3,339·4 (118)	2,122·5 (75)	2,631·9 (93)
Bomboo from existing forests in use.	Metric tonne (tons)	10,984·517 (10,811)	..	..	..	11,972·117 (11,783)	..	11,972·117 (11,783)	..
New areas	Do.	997·761 (982)	..	498·880 (491)	..	1,995·512 (1964)	..	199·512 (1964)	..
Palm trees	Do.	..	..	..	..	..	..	..	..

(*a*) Figures are to be taken from tables 2 (industrial wood), 10-a (bamboo), 10-b (palm species) and 11 (fuel wood and Industries woodwaste).

1. Industrial wood.

2. Fuel wood (including wood for charcoal).

TABLE 27.

SUPPLY (PRODUCTION PLUS IMPORTS MINE EXPORTS) OF FUEL—AVERAGE 1953–55.

Country :—Madras State, India.

Kind of fuel. (1)	*Unit.* (2)	*Quantity.* (3)
Fuelwood (1)	Cubic metre. (1 000 cft.)	893,940·40 (315,880)
Charcoal (2)	Metric tonnes. (tons)	95,769·825 (94,257)
Bomboo	Do.	101·605 (100)
Agricultural residues (bagasses, rice straw, coconut shells, etc.)	Do.	50,802·5 (50,000)
Cow-dung *	Do.	14,90,951·770 (14,67,400)
Vegetable oils (for light)	Do.	1,016·06 (1000)
Hard coal †	..	..
Brown coal †	..	..
Lignite	..	..
Mineral fuel oil (petroleum, etc.) ..	Litres. (gallon)	54,223,010·747 (119,27,736)
Manufactured gas	..	Nil.
Hydro-electric power	Kilowatt in millions.	1,052·34

1. *See* table 11. 2. *See* table 12.

NOTE.—* It has been assumed that one head of cattle gives ·508 metric tonnes (½ ton) dung (dry) during the year and 25 per cent of it is used as fuel.

† Details not available.

TABLE 28.

PRICE OF DIFFERENT FUELS IN CONSUMING CENTRES.

Country :—Madras State, India.

Currency—Rupee.

Kind of fuel.	*Unit.*	*Price per unit delivered to household in*		
		Big city 1.	*Smaller town* 2.	*Village* 3.
(1)	(2)	(3)	(4)	(5)
		RS.	RS.	RS.
Fuelwood—				
i. Casuarina	1·016 Matric tonnes (ton)	65 to 70	50	58
ii. Others	Do.	120 to 160	112	38
Charcoal	Do.	120 to 160	112	100
Lignite .. .. / Antharsite ..	..	..	Nil.	..
Petroleum (Petrol only).	4·546 litres. (gallon)	2·65	3·09	3·29
Bensine	..	..	..	..
Fuel oil	4·546 litres (gallon)	1·22	1·32	1·42
Gas	..	..	..	..
Electricity	Kilowatt	0·06 to 0·25	0·28	0·25

1. Name of the city: Madras.
2. Name of the town : Karaikudi (Ramanathapuram district).
3. Name of the village : Natham (Madurai district).
Give name of species (also latin name).

ANNEXURE II.

CONSUMPTION OF ROUNDWOOD AND ITS PRODUCTS BY END-USES.

In estimating present consumption and future requirements of fuel-wood bamboo and palm-trees, the following end-uses have to be taken into consideration.

I. *Construction*—

1. *Housing*—(Including repairs)—Walls, structural elements, Carpentry and joinery, scaffolding and formwork.

2. *Non-residential construction.*—(Including repairs) In dustrialand commercial building such as factories mills, warehouses and offices, churches, harbours, railway stations, waterways, bridges, dikes, embankments and other civil engineering; schools, hospitals, public buildings for administrative and military purposes.

3. *Rural use.*—(except new housing) Storage rooms, fences, weaving paraphernalia, domestic, agriculture and fishing implements.

II. *Mining.*—(Deep-mined coal, lignite and metallic ores mining)

1. *Pitprops.*—(wood used in the round) Including repairs and maintenance.

2. *Sawnwood.*—Including repairs and maintenance.

III. *Transport and communications*—

1. *Railway sleepers.*—(including renewals).

2. *Vehicles.*—Railway passenger carriages, motor-cars, carts commercial road vehicles.

3. *Shipbuilding.*—(including repairs)—All types of vessels, including rafting.

4. *Transmission poles*—(including telegraphs not telephones).

IV. *Woodworking Industries*—

1. Furniture.

2. Watch Industry.

3. Other wood working Industries.—Basket, sporting goods, ladders, etc.

V. *Packaging.*

VI. *Painting.*

VII. *Other end uses (Textiles, etc.)*

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